June — 7 IMPORTANT RADIO ARTICLES — 25 Cents

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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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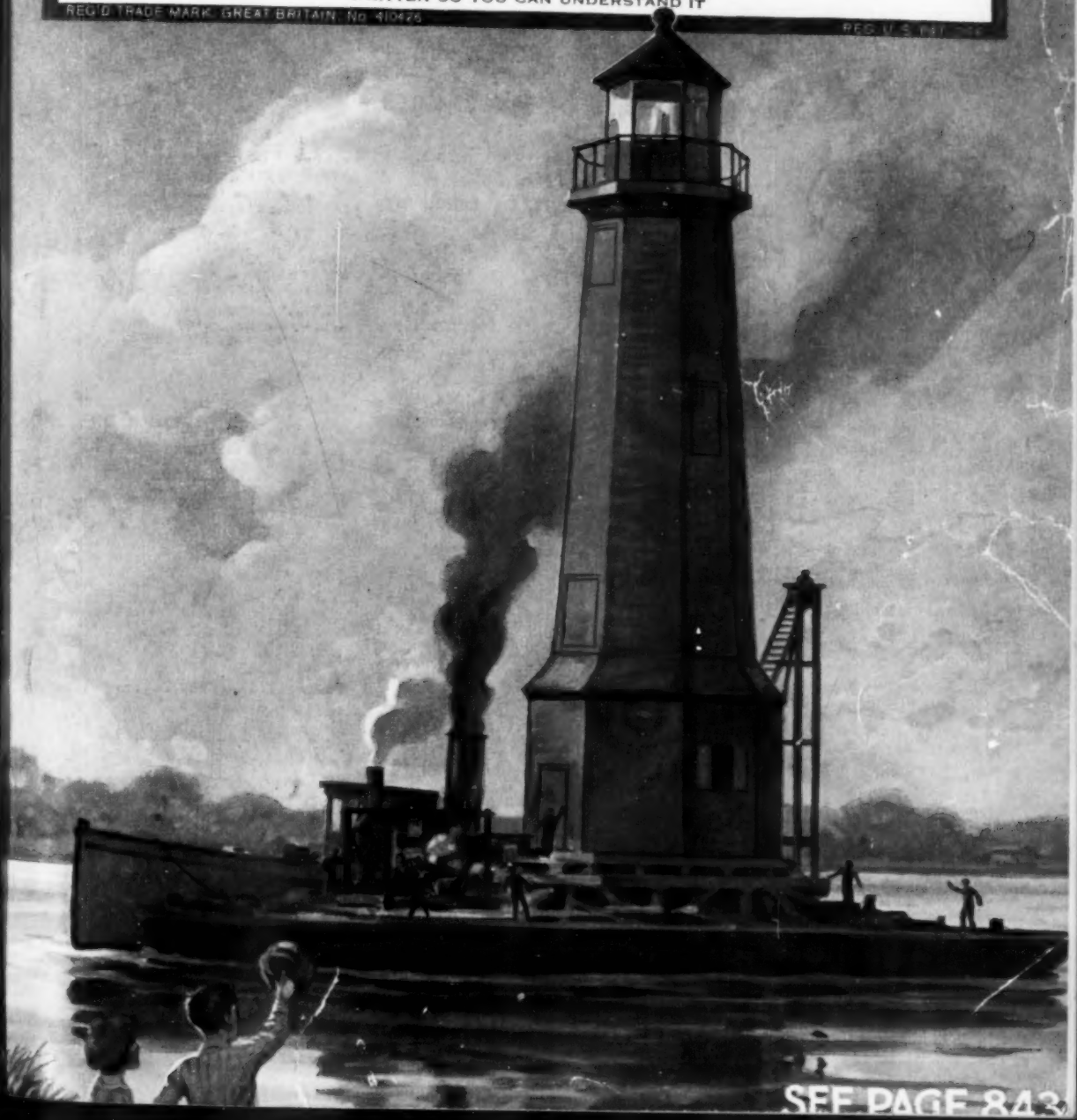

SEE PAGE 843

Learn Auto and Tractor Trade

Fill a Job Like This!

A Raise of $150 a Month

How 8 Weeks' Scientific Practice With Tools Lifted Me From a Laborer's $12.50 a Week To a Foremanship at $2,400.00 a Year

A TRUE STORY—By Louis Beimer
MARLIN, TEXAS

At the age of 20 years I was drawing $12.50 a week—laborer's pay.

At the age of 24 I am a foreman and my salary is $2,400.00 a year.

But it didn't take me four years to make the jump. I qualified for the advancement *by only eight weeks' scientific practice with tools.* Then, in two quick steps, I reached my present position.

Those eight weeks were spent in one of Henry J. Rahe's big auto and tractor schools. I earned $50 a month before I went there. On my return home, I went to work for $150 a month and in a very short time was made foreman at $200 a month—a total salary increase of $150 *a month,* due entirely to Rahe training.

If you want to get ahead QUICKLY, take the quick, easy, thorough course at a Rahe School.—Louis Beimer.

Louis Beimer
who says Rahe training put him on "Easy Street" *in two months.*

Wayne Russell, 20 years old, of Waldo, Ark., says Rahe training multiplied his pay by TEN. "I earned $1.50 a day before," he writes. "My salary is now $1.50 *an hour.*"

W. W. Peace, another Rahe graduate, writes of getting $250 a month *and expenses* operating a tractor in the oil fields.

Emanuel Rushfeldt, Vulcan, Alberta, says, "Earning $10 a day. Formerly earned $50 a month; 20 years old."

Thousands of Rahe-trained experts make success reports like these.

I'll Pay Your Railroad Fare

To CHICAGO or CINCINNATI

I'm going to start hundreds of men to QUICK success in the next few weeks, just as I started Beimer. Be one of them and travel FREE to my nearest school. I'll pay your railroad fare to my school nearest your home, no matter what part of the country you live in.

Special Course for High School Students

Limited Classes now forming for June 12, 19 and 26, July 3 and 10.
Write NOW for SPECIAL LOW RATES.

Be a Specialist! Get out of the grind—out of the army of unskilled job hunters! My easy, practical course in motor-maintenance engineering will make you an expert—*a specialist*—in just a few weeks!

A Job Is Waiting For You!

This is a BIG year in the motor business. Thousands of Rahe-trained specialists are needed. It's YOUR big opportunity. Let me *prove* it! Write me *today.*—

Be Sure to Address My Nearest School

Dept. 892 **Rahe Auto & Tractor Schools**

CHICAGO
Michigan and Ontario

CINCINNATI
Ninth and Walnut

Thousands of Men Needed; $3,000 to $10,000 a Year!

More than 40,000 men have taken the "Rahe Way" to success. Thousands more are needed now. I never knew a better time to start. Calls for Rahe-trained men come from all parts of the country.

Quick, Easy Training

No "book-learning" required—just easy, scientific practice *with tools* on engines, cars, tractors. Master instructors tell you the "hows" and "whys." I furnish *everything.* And *in just a few weeks* you'll be ready for BIG MONEY.

FREE My big illustrated book, details of free fare and low tuition and proof of what Rahe training will do for YOU. Write for them *now*—a card will do.

Henry J. Rahe

Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 37 JUNE, 1922 No. 6

When the Brakes Are of First Importance

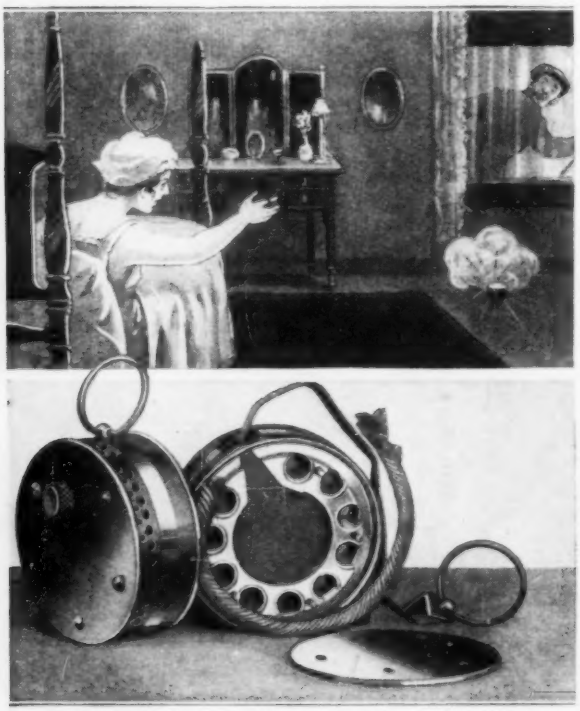
IN THE WEST, logging camps are mostly situated in the hills, and the heavy loads of logs have to be hauled out, always downhill. Often that helps to make the hauling easy, but sometimes the grades are so steep that it makes it too easy—so easy that it entails difficulty. Indeed, in these instances the term hauling is a misnomer, for that implies pulling the load, and the operation actually consists in pushing against the load instead of pulling it. Two and a half miles of specially constructed track is used at one western logging camp for transporting heavy loads on a large motor truck down a very steep grade. The truck is six-wheeled, and has powerful brakes on its four rear wheels. These brakes are controlled exclusively by one man, while another takes care of the driving and steering.

The wooden track has a continuous serpentine wire cable fastened to it so that it keeps the wheels from slipping when the brakes are on, and helps the traction in going upgrade. Along the center of the track, and between the car wheels, are two wooden guides that help the driver to keep the truck from leaving the track.

Specially Constructed Track for Hauling Heavy Loads on a Truck down a Very Steep Grade: Two Operators Are Necessary, the One on the Right Having Exclusive Control of the Brakes on the Rear Wheels. The Driving and Steering are Done Entirely by the Other Man

PROTECTION-SIGNAL DEVICE FIRES TEN SHOTS

As a protection against burglary or theft, an alarm signal has been devised which is adaptable to many uses. In size, it is only a little larger than a big watch, which it resembles. It is loaded with 10 blank cartridges which are fired by a fuse on the inside of the device. In case of danger it is only necessary to release a safety catch on the face of the device and drop or throw the signal, keeping hold of the finger ring, from which the alarm is released when flung. This action ignites the fuse, which in turn fires the 10 shots in succession. The device can be attached to windows or doors to act as a burglar alarm or fastened to a parked automobile, and may also be carried in the pocket to be used as a distress signal in case of holdup. After being fired, the case may be returned to the manufacturer for inspection and reloading.



By Pulling the Finger Ring of This Alarm Signal, the Fuse is Ignited, and This Causes 10 Blank Cartridges to be Fired in Rapid Succession

¶ Announcement was recently made that the government of Brazil had officially changed the name of the River of Doubt, discovered by Theodore Roosevelt, to the Roosevelt River.

HIGH-PRESSURE GAS SYSTEMS TO SOLVE FUEL PROBLEM

In the interest of economy and as the first step toward the solution of the fuel problem, engineers are now seriously considering the plan of converting the coal at the mines into gas which would be distributed through pipe lines to distant cities. Under this plan, large gas plants would be erected at the mines, and the gas would be piped under high pressure to the cities, where it would be used for nearly all purposes where coal is now employed, such as steam and heating plants. At reduced pressure, it would be introduced into the service mains for household uses.

Under present conditions, it costs more to transport and distribute a ton of coal than the coal itself costs at the mine, and the saving of these charges should be sufficient to defray the costs of installation and upkeep of the gas plants and pipe lines. The value of the by-products recovered during the distillation of the coal would form an important source of revenue which would go far toward reducing the cost of gas. The secondary economies resulting from the use of this clean fuel would be beyond calculation. Better economy of the heat contained in the fuel would be manifest immediately, while the abolishment of the smoke nuisance in the cities would effect savings in innumerable ways.

Long-distance transmission of electricity over wires and the transportation of oil for great distances through pipe lines now are common practice, so, while the distribution of high-pressure gas may at first appear as a radical departure, it is, in fact, but a logical step in the interest of economy and convenience.

RADIO APPARATUS WILL MAKE MOUNTAIN CLIMBING SAFER

A French engineer, after years of study, has succeeded in constructing radio apparatus capable of withstanding the severe atmospheric changes of high altitudes that would break ordinary instruments. It is proposed that mountain-climbing parties in the vicinity of Mont Blanc be supplied with small wireless outfits with which to summon aid in case of necessity.

REMARKABLE GLIDER FLIGHT IN SWITZERLAND

Above: The Motorless Glider in Flight over the Snow-Covered Hills. On This Flight the Glider Was in the Air for 40 Seconds and Attained a Height of More than 150 Feet in Its 600-Yard Flight. Right: About to Take Off for a Flight. This Machine Appears to Be Much Smaller than Those being Used for Gliding Flight in Germany. It is Patterned Much after the Standard Airplanes, the Construction, However, Being Much Lighter. The Glider is Launched by Moving Forward against the Wind from the Top of a Small Hill

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CAÑON WALLS SERVE AS POLES FOR TRANSMISSION WIRES

With a right of way that runs through solid rock, the Denver and Rio Grande Railway finds that in certain cañons it is more practicable to use the sides of walls than to try to set poles along the tracks. Braced steel brackets driven into the walls of the cañon serve to carry the wires. To reach these, it is necessary to use hanging ladders which are made of 2 by 4-in. pieces held by heavy cables. The railway, in many places, has to divide its right of way with a stream.

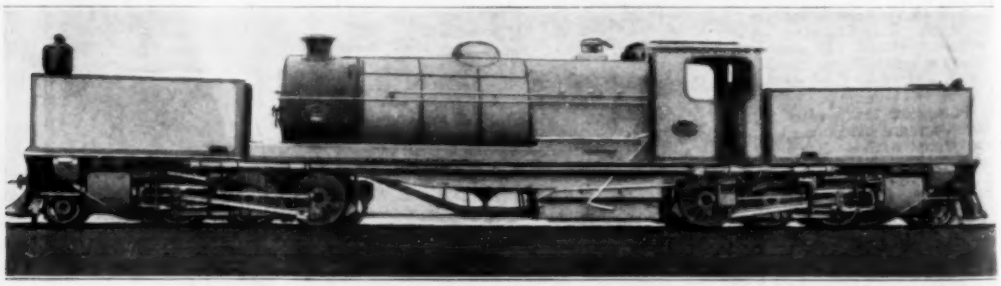
Placing the Wires on Steel Brackets Set in the Wall was Found to Be the Most Practical Method of Carrying the Wires through This Narrow Cañon

NEW LIBRARY AT LOUVAIN NOW BEING ERECTED

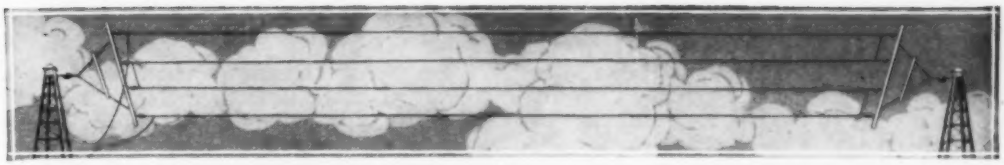
The library of the University of Louvain, that was destroyed by the Germans during their march through Belgium in 1914, is to be replaced by a building which is a gift by the people of the United States to the Belgian people. The new structure, the contract for which is already let to a New York concern, will cost more than $1,000,000, and will be in the style of the Flemish Renaissance, surmounted by a tower 375 ft. high, with a main building 220 ft. long and 150 ft. wide. In the tower is to be a belfry, and a carillon, or chimes, that will play the national airs of all the allied nations. The corner stone of the building was laid with appropriate international ceremonies, July 28, last year.

DOUBLE-DRIVE LOCOMOTIVE WITH BOILER IN CENTER

Very unusual in design, at least as far as this country is concerned, is a locomotive built in England for use in South Africa. The object of the design is to obtain the greatest possible power for any given weight allowance. A very even distribution of the weight over the axles is obtained by placing the boiler between two driving systems, which are in connection with a tender at each end. The boiler itself is like that of any other locomotive, and at its fire-box end is the cab. This construction provides room for a very large boiler with great steam-producing capacity.



Locomotive with Tender and Driving System at Each End, Designed to Accommodate a Large Boiler with Great Steam-Producing Capacity in Proportion to the Total Weight: It was Built in England for Use in Natal, South Africa

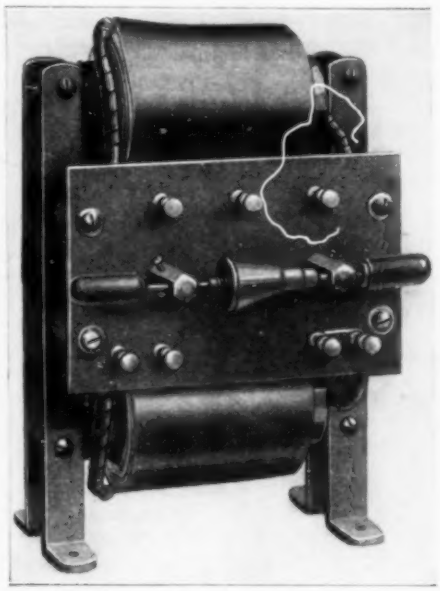


HIGH-TENSION DIRECT-CURRENT POWER FROM HOUSE CIRCUITS

New Machine Changes 110-Volt Alternating Current to 10,000-Volt Direct Current—Inexpensive Wireless Sending Sets for Amateurs Is Probable Result

By H. A. LANE

RESEARCH, study, and practice during the history of electricity have resulted in the present-day usefulness of this wonderful and invisible force or energy. The mere pushing of a button to illuminate a home, and the throwing of a switch to put huge machines into operation, were considered marvelous when first introduced, but are quite commonplace now. Today one of the most absorbing problems confronting the minds of those engaged in the electrical industry, is the development of wireless telephony and telegraphy. Numerous broadcasting stations enable reproductions of the voices of noted speakers and singers, and also musical scores, to be heard within the family circle for the benefit and entertainment of all who care to listen. To enjoy the concerts, speeches, etc., which compose the "current events" of the radio world, all that is needed is the possession of a receiving set with the ordinary simple wiring for an aerial. Should the amateur, however, desire to do any sending or broadcasting, he must first install costly and more complicated equipment, such as motor-generator sets, large batteries, vacuum tubes, filaments, or similar apparatus found in the usual sending stations. This entails a considerable outlay of money, and is a drawback to persons who are not supplied with sufficient funds to carry out their ideas of an experimental nature. To these experimenters and amateurs, great possibilities have been opened up by an invention of C. H. Hulbert, of Chicago.



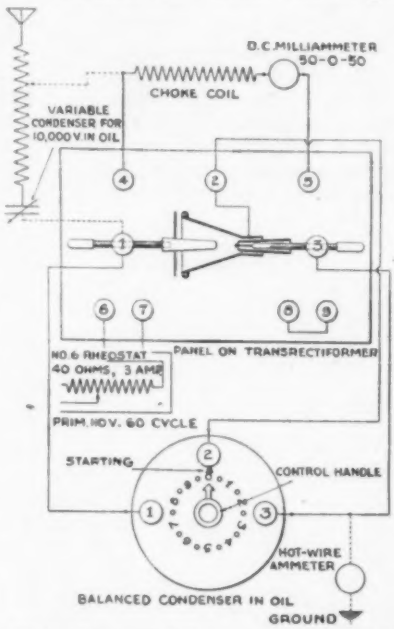
"Transrectiformer" Which Changes the Ordinary House-Circuit Current to High-Voltage Alternating Current, and Then Rectifies It to Direct Current

This man, whose typical and sound maxim is, "Thinking about anything is all right, but if you want results, you must work it out," has patiently persevered in his theory since 1907. At that time, when employed by the government in the Philippine Islands as an expert electrician, he conceived the idea of producing high-voltage direct current from a low-voltage alternating source. In short, rectification was his constant thought. Those familiar with alternating current know the characteristics of the sine wave, and its deviation from "zero" to "maximum," on one side of a given line, and then the reversion back to zero again, from which the curve extends to a maximum on the other side of the line. The progression from one maximum to the other constitutes a cycle, frequency, or revolution.

This cycle, therefore, consists of two actual deviations from the center, or zero, both of equal strength, but in opposite directions. Therefore, if an alternating current has 60 complete cycles per minute, which is the common lighting voltage used in homes, and an interrupter, or spark gap, is employed in the circuit and operates 60 times per minute, it can be readily seen that during the periods when the gap is closed, an even flow of 60 half cycles will ensue, producing a direct current.

Acting upon this theory, Hulbert tirelessly pursued his experiments, trying various windings, or coils, and experimenting with different voltages. Although having left the employ of the government and embarked in mining ventures on the islands, the hard-working genius gradually became convinced that electrical research was his real field. In July, 1921, he decided to come back to the States and completely develop his idea. The results speak for themselves. His vision has been rewarded with the production of an instrument that performs, at one operation, the astonishing feat of transforming low-voltage alternating current to a high-voltage direct one.

By connecting the apparatus to an ordinary 110-volt, 60-cycle alternating-current lighting circuit, it is possible to obtain 10,000-volt direct current at 30 milliamperes, thus yielding 300 watts of power. In addition to attaining this remarkable result, there are no rotary or vibrating parts to get out of order, no jars to break, no cells to overheat, no fragile and expensive vacuum tubes to replace, and no filaments to burn out or depreciate.



Wiring Diagram of Transrectiformer Which Illustrates the Different Connections

Especially appealing to the experimenter is the great durability of the machine, it being practically impossible to burn out the windings, if but the usual care is taken. The apparent economy of the apparatus will aid many chemical and physical-research laboratories in colleges, schools, and factories, which have been forced to omit laboratory work requiring high-potential direct current, simply through the lack of necessary financial means. Continuous-wave telegraphy will also be greatly reduced in cost by the invention.

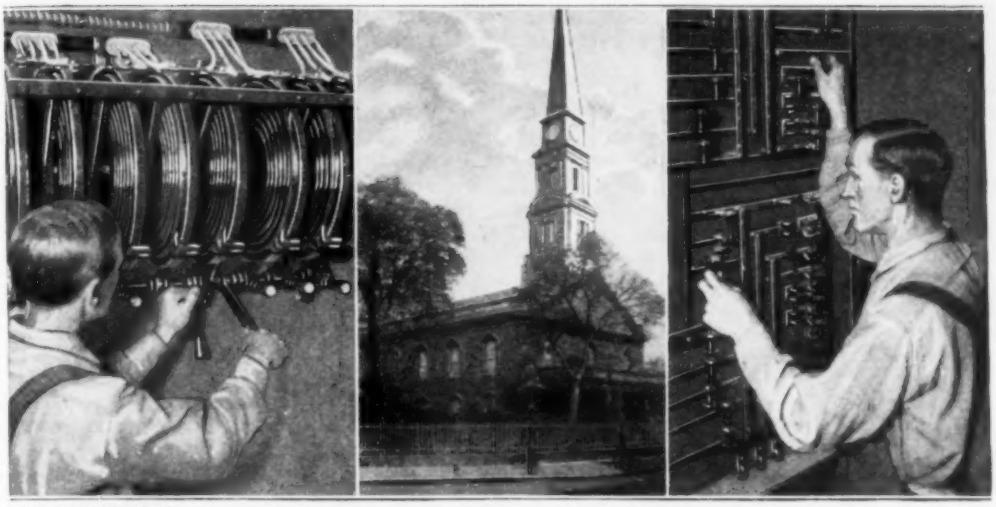
Other uses to which the Hulbert machine can be put are X-ray photography, smoke precipitation, the testing of high-tension insulating materials, as well as many practical adaptations in the industrial and scientific world, where the methods now in vogue are expensive and inefficient by comparison.

Wireless operators who have examined the apparatus realize the possibilities of a new method of selective sending, while power engineers are impressed with the production of high-voltage direct current. X-ray experts are astonished to learn that alternating current could be transformed and rectified to any desired potential and wave form of direct current. The united opinion of those who have witnessed demonstrations of the machine is that a great field of usefulness awaits the practical application of this noteworthy invention, but that, as yet, its real worth cannot be estimated.

Any Kind of Tune, Soft or Loud, can be Played on This Whistle under the Hood, Which is Controlled, as Shown, by a Handle near the Steering Wheel

AUTOMOBILE WHISTLE PLAYS ANY TUNE AT ANY PITCH

Any tune can be played by any autoist, musically educated or otherwise, on a novel kind of auto accessory in the form of a whistle that is under the hood, and is operated by a handle near the steering wheel. The pressure necessary to blow the whistle is supplied by the exhaust gases from the motor, and the volume, as well as the pitch, of the sound is under perfect control by means of the operating handle. Already, it is stated, a great number of these whistles have been installed on automobiles.



PHOTOS BY GILLIAMS SERVICE

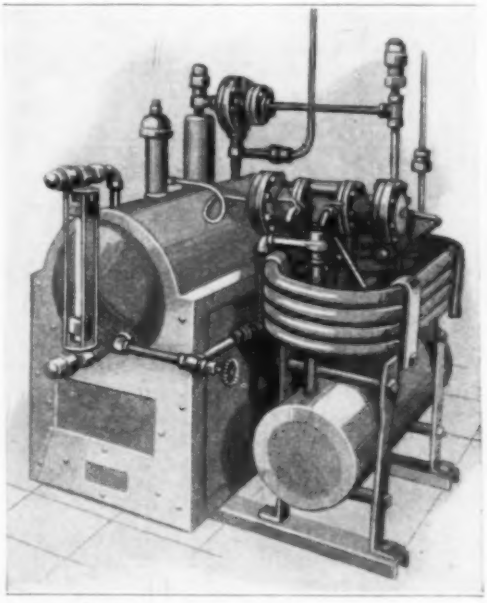
Left: Part of Electrical Equipment Known as Dimmers, Which are Used to Vary the Brilliancy of the Lights. Center: St. Mark's Church in New York City. Right: Portion of Elaborate Switchboard Which has been Installed in the Church to Produce Unusual Lighting Effects

UNUSUAL LIGHTING EFFECTS PRODUCED IN CHURCH

Lighting effects, vastly different from those ordinarily used in churches, have been produced in St. Mark's Church, New York City. The Rev. William Norman Guthrie, rector, conceived the idea of delivering "prismatic sermons," meaning the use of varicolored lights in synchronism with the sermon. Realization of this unusual undertaking required rather elaborate electrical equipment. Fixtures, having lamps of red, blue, green, and amber color, were uniformly distributed throughout the interior, each lamp being so wired that either of the various tints, or a diffusion of two or more of them, could be obtained from the switchboard. Clear lamps and spotlights, with special shields that conceal them from the congregation, are also installed in sufficient numbers to provide proper illumination for reading purposes. Favorable comment on the innovation has been plentiful, and it is thought that the same, or a similar, course will be followed in other places of worship.

HOME REFRIGERATION PLANT SIMPLE AND NOISELESS

Refrigeration, as a home process, has been made simple and automatic by the introduction of an ice machine which operates on the ammonia-absorption principle. This method results in the drawing out of the heat in the refrigerator, and creates a perfectly dry, cold atmosphere. No moving parts are incorporated in the apparatus, which consequently functions without any noise and needs practically no attention or care. The outfit, which requires city-gas and water connections,



Simple and Noiseless Home Refrigeration Plant, Showing Generator-Absorber, Condenser Coils, and Outgoing and Return Pipes

and an outlet through a drainpipe, is claimed to be less expensive in operation than the cost of ice in maintaining the same temperature.

MEMORIAL TO ROBERT E. PEARY TYPIFIES ARCTIC EXPLOITS

A monument has been erected at the Arlington National Cemetery in memory of the late Rear Admiral Robert E. Peary, discoverer of the north pole, and was unveiled April 6, the 13th anniversary of his achievement. The monument is fashioned from a design of the explorer's own suggestion. It is in the form of a large globe with the terrestrial continents and islands embossed on it, and in proper axial position with the north pole, represented by an embossed star. This globe rests on a solid granite base, upon which are suitable inscriptions. The actual unveiling of the monument was done by the late admiral's daughter, who was born in the arctic regions during one of the polar expeditions, and was known as the "Snow Baby." The ceremonies were under the auspices of the National Geographic Society, and were participated in by President Harding, the secretary of the navy, and other high officials.

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Granite Memorial to Rear Admiral Peary in Arlington Cemetery, Unveiled April 6, the Thirteenth Anniversary of His Discovery of the North Pole: It Is a Reproduction of the Earth, with the North Pole Shown by an Embossed Star

"DIRECT-POSITIVE" HOME-MOVIE CAMERA

An interesting development arising out of the invention of the so-called "direct-positive" photographic paper is the direct-positive motion-picture camera. This camera, in operation and appearance, resembles the ordinary one, but instead of the celluloid negative film, it uses the new paper, which eliminates printing and makes it possible to show the pictures within three minutes after the exposure has been made. The camera also offers a ready means of satisfying the curiosity of thousands of potential movie stars—not to mention the millions of "fans"—who are anxious to see how they themselves "register."

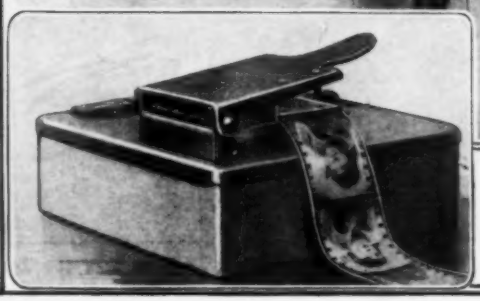
To show the subject in continuous motion, the "film" is punched and cut into separate pictures by a special device, and the cut pictures inserted into a booklet provided for the purpose. By running the booked pictures between the thumb and index finger, the illusion of motion is produced, as in the almost-forgotten Edison "mutoscopes" of the early nineties. The machine utilizes perforated paper of the same width as the regular motion-picture film. However, it is not restricted to the use of perforated paper; an additional device incorporated in the camera enables the operator to use plain paper at will, which, in many cases, is a desirable advantage.

Under ordinary operating conditions, six exposures per foot of paper are made. As the machine holds a roll containing 200 ft., about 1,200 pictures are possible before it becomes necessary to reload. The camera weighs 10 lb.; measures 6 by 7 by 12 in., and is equipped with a high-grade lens. A counting device connected to the crank handle registers the number of exposures made, each revolution of the crank handle causing one exposure.

The photographic medium is a specially prepared bromide paper, requiring one minute for developing and two minutes for fixing and toning. It has a remarkably high speed, rivaling that of a good grade of fast dry plate. Two fully timed exposures per second are possible even with the scant illumination furnished by a 500-watt lamp. Of course, with the illumination produced by high-actinic lights, or under daylight, much higher speeds are possible.

This Is the Camera for Taking Moving Pictures at Home on Strips of "Direct-Positive" Paper. Each Revolution of the Handle Causes One Exposure to be Made, and Two Fully Timed Exposures per Second Are Possible. A Counting Device Regis ters the Number of Expo sures Made

The Finished Pictures can be Bound in a Case, and When Allowed to Slip Rapidly under the Finger, will Give the Appearance of the Subject in Motion



Above: The Camera Case Open, Showing the Unexposed Roll of Paper Above and the Finished Pictures Below. Left: The Perforating Device

ELECTRICALLY HEATED KNIFE AIDS BATTERY MEN

Storage-battery, tear-down, and reassembly work has been facilitated by the introduction of a knife having an electrical-

A Special Electrical-Heating Element in the Knife Makes It an Easy Matter to Remove the Sealing Compound from Storage Batteries

heating element in the blade, which is fastened in a heavy handle. Attached to the handle are rubber-covered wires terminating in clips for connection to any six-volt cell, which quickly heats the appliance for the removal of sealing compound or the resealing of batteries.

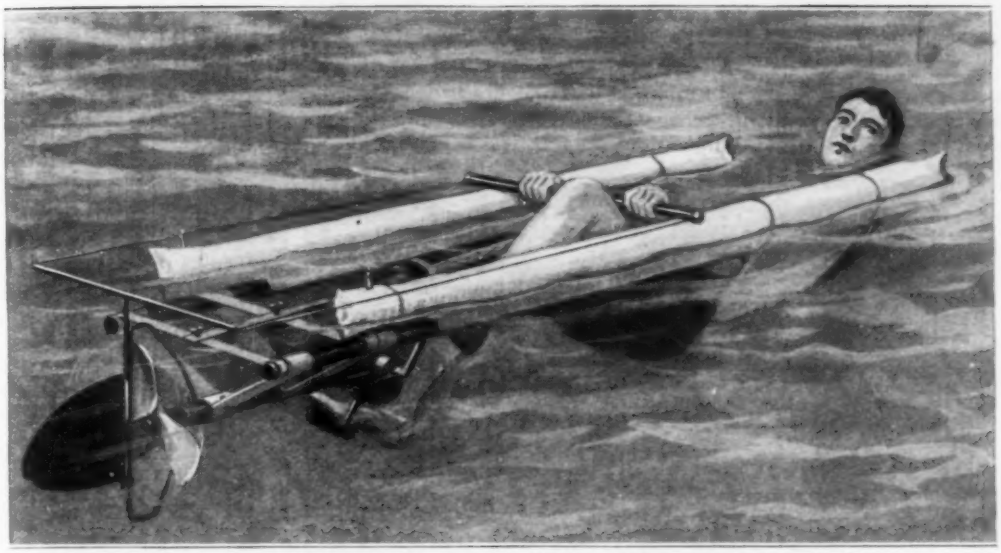
REDUCE DUSTINESS OF MINES BY USING WET DRILLS

Investigation by the Bureau of Mines has shown definitely that the so-called wet drills, used in mining, aid materially in reducing the dustiness of the air in drilling places. It has been found, however, that if not operating properly, or if out of repair, the wet drills may throw into the air a mist or fog laden with minute mineral particles which is almost as dangerous, when breathed, as dry dust. Also, if water, or compressed air and water, under excessive pressure, is forced through the drill, this mineral-laden fog is produced. But even at their worst, the wet drills produce more healthful conditions than the dry drills.

CENTURY-OLD STUMP MILL STILL GRINDS GRAIN

After more than a century of usefulness, an old-fashioned stump mill in South Boston, Ind., is still grinding grain today. The burrs, or stones for the mill, were brought over to this country from France, 117 years ago, and were placed in position by the great-grandfather of the present owner. Horsepower is used to operate the grinding mechanism, and 20 minutes are required to grind a bushel of wheat, or three minutes for the same amount of coarse feed.

This Old-Fashioned Burr Mill is Still being Used Today, Although It Is More than 100 Years Old. Horses Walking around the Circular Path Furnish the Power



In Using This Watercycle, the Bather Lies Partly in the Water and Turns the Pedals with His Feet, and the Gear-Driven Propeller Sends the Craft Ahead at Good Speed. The Entire Machine Weighs Only 20 Pounds

A LIFE-SAVING WATERCYCLE FOLDS INTO SMALL SPACE

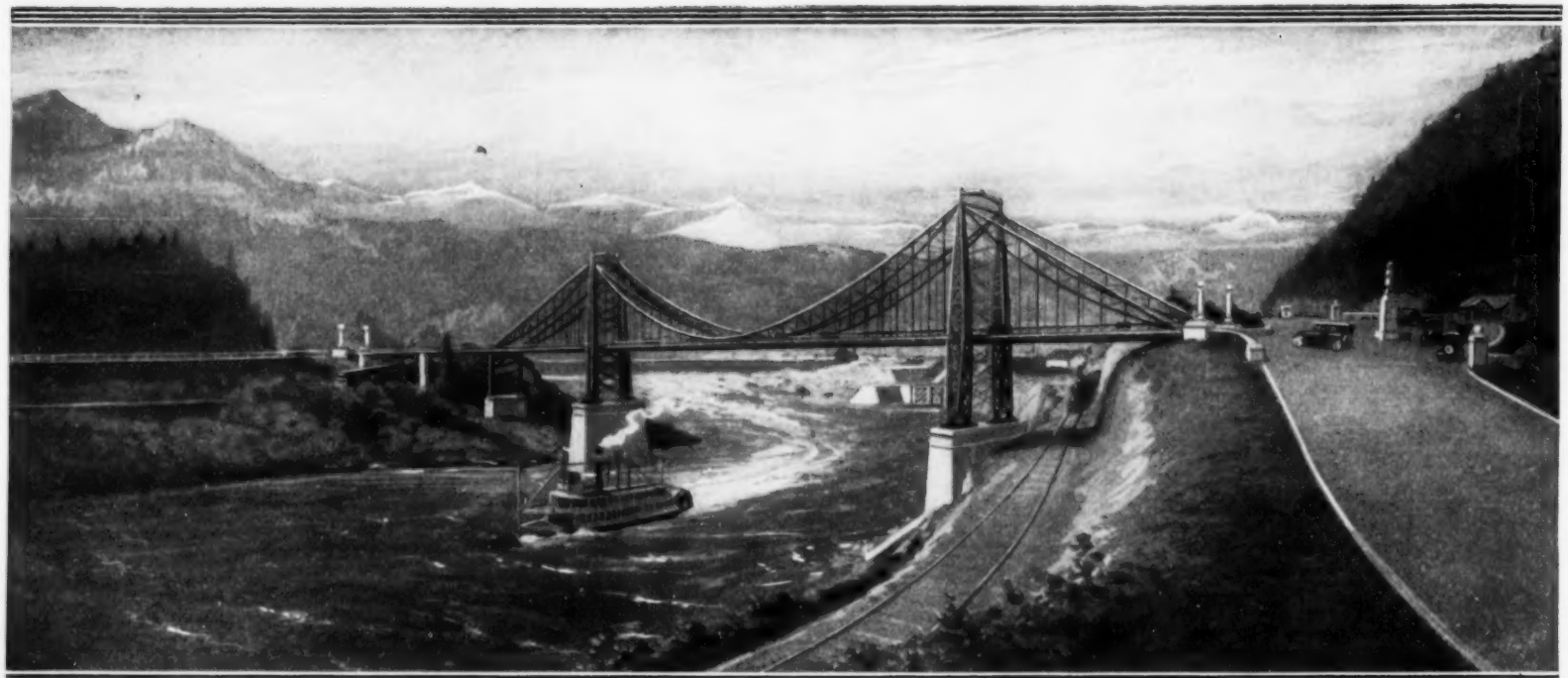
A watercycle has been invented by a Wisconsin man which can be used for life-saving purposes or as a pleasure craft for bathers. The frame is made of aluminum tubing and is of knockdown construction, held together by thumbscrews. Buoyancy is supplied by two air-inflated tubes, in balloon-cloth cases, which slip over the side tubes of the frame. The watercycle is forced through the water by a gear-driven propeller which is operated by bicycle pedals, the machine being steered by a rudder and handlebar. A "lazyback" is supplied when the cycle is to be used as a pleasure craft. The different parts of the machine are adjustable to suit persons of different build, and when dismantled, can be folded and packed in an ordinary suitcase. The complete machine weighs only 20 lb., and when used by a life-saver should develop a much greater speed than the fastest swimmer.

EXPEDITION TO INVESTIGATE MOUNTAINS OF BURMA

With the object of investigating some features in the mountain structure of northwestern Yünnan, and western Szechwan, an expedition, consisting of scientists of the university of Glasgow, Scotland, is on its way to Burma. The district is one of special geological and biological interest. It includes mountain ranges that are believed to be a prolongation of the Himalayas, and that contain peaks of from 20,000 to 25,000 ft. in height. Zoölogical and botanical collections will be offered to the British Museum of Natural History, and to the India Museum, Calcutta.

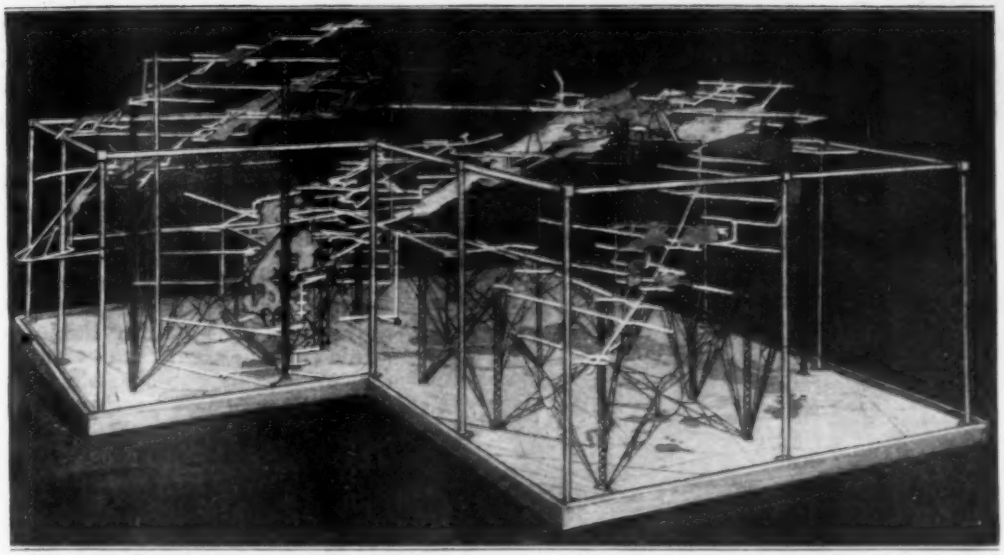
NEW REPRODUCING APPARATUS AIDS RADIO RECEPTION

Wireless enthusiasts now have available a new regenerative receiver and a reproducing apparatus, which will greatly aid in the reception of broadcast radio communications. The receiver has a condenser with two capacities brought out to separate binding posts, the lower capacity being used for wave lengths up to 350 meters, while the higher capacity is used from this point up to 500 meters. The sound-chamber arrangement possesses a special metal diaphragm, which is said to yield the finest quality of reproduction.



MODERN STEEL STRUCTURE AT SITE OF LEGENDARY "BRIDGE OF THE GODS," ACROSS COLUMBIA RIVER

AT CASCADES, on the Columbia River, about 50 miles east of Portland, Ore., according to Indian legend, the river was spanned, before the days of the palefaces, by a natural bridge in the form of a rock arch, which they called the "Bridge of the Gods." Something that the Indians did displeased the gods, who, in their wrath, destroyed the bridge. Once more at this site the river is to be spanned by a bridge, to be completed by the fall of 1923, built by white men, independently of the red men's gods, and likely to be more permanent than its legendary predecessor. In the design of the bridge an attempt has been made to have it harmonize with the stately mountain scenery that surrounds it, but not at any sacrifice of structural efficiency. In this respect it is somewhat novel, for though in appearance it will be altogether like a suspension bridge, it combines with the suspension principle that of the arch, the 705-ft. main span being in effect an inverted arch truss, built entirely of standard structural-steel shapes. The headway clearance of this great span is 150 ft. The two pairs of steel towers supporting the main spans rise 240 ft. above their foundations, and are braced transversely by an elaborate system of crossbracing, and longitudinally by the back stays, which are trusses that connect the main spans with the abutment anchorage. These are very massive, and built of concrete with steel grillage. There will be 1,200 tons of steel in the bridge, and 5,000 cu. yd. of concrete in its piers and abutments.



This Model of the Underground Workings of Two Mines Shows How the Drifts, Tunnels, and Shafts, as Well as the Stopes, or Rooms from Which the Ore has been Taken, would Appear If All of the Surrounding Ground were Taken Away

INSIDE WORKINGS OF A MINE VISUALIZED BY A MODEL

In a recent lawsuit between mining companies in Utah, a model of the mine properties involved was constructed and used as an exhibit in order to show the inside workings of the mines. These mine workings form a very complicated network of rooms and hallways, sometimes extending to great depths, and the model shows in three dimensions the different openings and their relation to each other. The tunnels, raises, and shafts are made of brass rods, bent, cut, and soldered precisely to scale. The stopes, or rooms from which the ore has been extracted, are made of wood. The model is mounted on a board, showing a map of the mines as they appear horizontally.

NEW TELEPHONE CABLE LAID ACROSS IRISH CHANNEL

A new cable, 25⅓ miles long, has been laid from Port Mora, Scotland, to Port Patrick, Donaghadee, Ireland, which will greatly improve telephonic communication between those two countries. If the new cable is found to be satisfactory, trunk circuits will be provided between Glasgow and Belfast by joining up the land lines. The new cable contains four copper wires, insulated by balata, which provide two so-called "physical" circuits. A third circuit will be obtained by the system known as superposing, forming a so-called "phantom" circuit, which is equivalent to a third trunk channel that operates without interfering with conversations carried on over the two physical circuits.

LIFE-SAVING BELT ADOPTED BY BOLD BOOTLEGGERS

Recent raids by prohibition authorities in Milwaukee, Wis., have furnished another proof that the ways of the bootlegger are devious. In one of these raids, the chief prize consisted of a life-saving belt, the interior of which was designed to hold liquor, instead of the old-fashioned cork compositions. In use, the belt was hung by straps from the shoulders, resting just under the armpits, so that by pressure of the arms the vender could force the liquid through a faucet affixed at the top.

STRIPS OF MULCHING PAPER PREVENT WEED GROWTH

Weeding would become a lost art if the use of mulching paper could be applied to all gardens as successfully as it is in growing pineapples. In this case the strips of paper are rolled out where it is desired to plant, and slits are cut in the paper through which the pineapple suckers are planted. Nothing more is needed until harvest time, as the paper strips prevent the growth of weeds, and conserve the moisture. This method has been introduced in the Philippines, where it has increased the yield of pineapples, according to good authorities.

These Pineapple Plants are Growing through Slits Cut in the Strips of Mulching Paper, Which Prevent the Growth of Weeds

TESTS OF DARKENING EFFECTS OF VARIOUS FLOOR OILS

Under the direction of the Department of Agriculture, investigations extending over a period of six months have been made regarding the comparative darkening effects of various floor oils. Three types of mixtures were tested, in an occupied apartment, upon pine floors which were very old and dark from many coatings of shellac and varnish, and it was found that a floor oil consisting of one part of boiled linseed oil to three parts of turpentine was the most satisfactory. This oil had a cleansing effect, retained a high gloss, and did not darken to any extent the floor, to which it was applied with a mop.

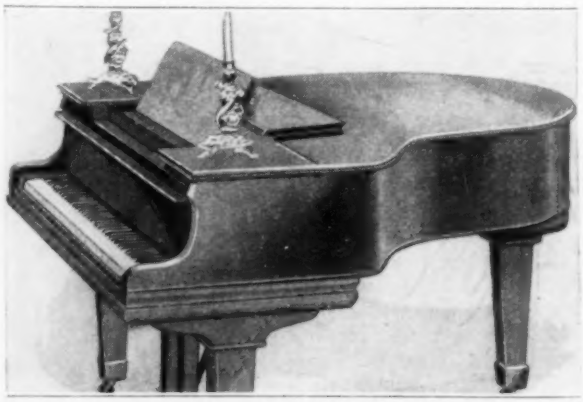
¶It is stated that on nearly 9,000 farms in New Zealand some form of electric milking machine is used.

TO PRODUCE ELECTRIC POWER WITH LOW-GRADE COAL

The problem of the utilization of low-grade coals and lignites is one of utmost importance to Australia. Recent investigations on low-grade coals, containing about 50 per cent of water in the raw state, show that their fuel value can be much improved by heat treatment below 400°C. (750°F.). A patented apparatus has been designed for drying and heat-treating the low-grade fuels in a continuous process, using only the sensible heat in the burnt gases passing from the boiler. This process is now being tested in a commercial way, and, if successful, will be used for the generation of electric power. It is claimed that by the use of this new process nine boilers will give the same steam output as would be obtained from 12 boilers fired with the untreated fuel.

THREE-SECTIONAL TOP LID FITS ANY GRAND PIANO

A patent three-section top lid for grand pianos, which can be fitted to any make of instrument and entirely does away with the projecting point of the lid at the curved corner of the instrument, has been brought out by one of the largest piano makers in England. The new lid is much neater in appearance than the conventional one. When folded back, it leaves the top of the piano almost entirely clear, and objects on each side of the front of the piano top, such as lamps or candlesticks, are left undisturbed by it.



Three-Section Top Lid for Grand Pianos, Now in Use in England: When Folded Back, as Shown, It Is Very Compact with No Projecting Point at the Curved Middle of the Right-Hand Side of the Instrument

RADIOTELEPHONE BROADCASTING OVER LIGHT WIRES

RECENTLY Major General Squier announced a new and remarkable development, of his invention, in the art of broadcasting wireless telephone news and concerts. This is an outgrowth of "wired wireless," and a demonstration was held in the signal-corps headquarters where the usual receiving instrument was attached to the electric-lighting wires instead of to an antenna. To install the receiving apparatus, it is only necessary to remove a light bulb from its socket and attach a cord similar to those used for attaching a vacuum cleaner or electric iron. The broadcasting station is connected with the lighting circuit through a lamp receiver, and the wireless impulses travel over the circuit in much the same manner as is the case in using wired wireless over the telephone circuit. This method of broadcasting brings to every home where electric lights are used, the concerts and news that have previously been broadcast in the air. It is not necessary to erect an antenna; simply remove a light bulb and plug in the receiving set, and radio news is immediately available. No headpieces are required, as any of the regular loud-speaking instruments can be used. The further development of this idea should do much to relieve the present congestion of the air.

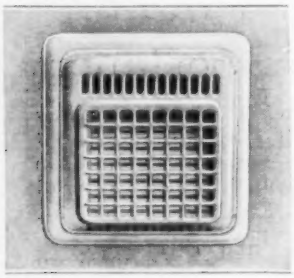
NEW MEANS OF CONTROLLING ERRATIC RIVER CURRENTS

At last, after 3½ years of experimentation, a means has been devised for controlling the treacherous currents of western rivers. The method applied consists in driving a number of concrete piles, about 35 ft. apart, into the river bed and anchoring to the top of each six 1-in. to 1¼-in. cables, about 100 ft. long. The other ends of these cables are spread out fanlike, and are connected to the stump ends of hundreds of cut trees, the interlacing boughs of which fill up any part of the river from bed to surface. The sand held in suspension by the running water is gradually deposited among the tree branches, forming in time a solid sand bar, and making possible the diversion of the stream in any direction desired. Thorough tests have been made on the Platte River, in Nebraska, and from the results of these tests it is believed that this new method of controlling a river current will be of incalculable value in reclamation work, and in protecting river banks.

¶Investigation is being urged as to the advisability of the creation of a United States Aeronautical Academy, to hold the same relation to the air service that West Point does to the army and Annapolis to the navy.

DESIGN WALL-POCKET HEATER SET FLUSH IN WALL

To meet the demand for a small auxiliary heating unit with which to remove the chill from the bathroom, or other small room, a wall-pocket gas heater has been designed which sits flush with the wall and occupies no floor space. It can be set into the wall in the space between the studdings, and because of its insulated construction, does not constitute a fire hazard. It burns with a yellow flame, and no air mixer is used, which prevents the possibility of back-firing. The reflecting back is arranged to direct the heat toward the floor from where it rises.

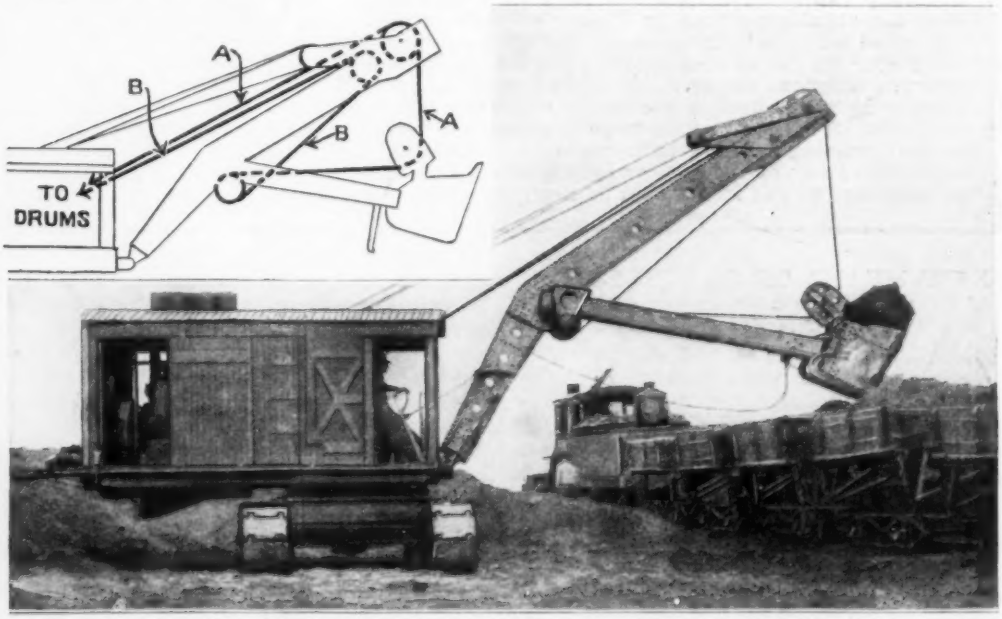


ONE GASOLINE ENGINE DRIVES NOVEL POWER SHOVEL

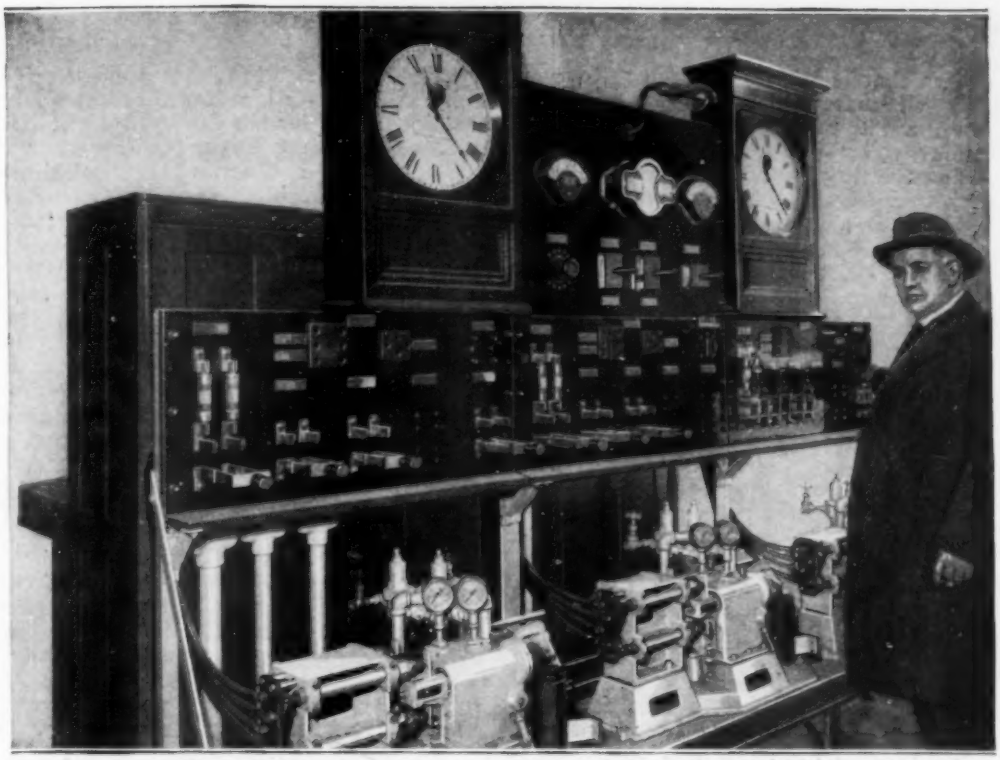
It has long been recognized that, to meet certain conditions, a gasoline-driven power shovel would have advantages over machines using other forms of power. Many attempts have been made, patterned mostly after the steam shovel, to adapt gasoline power to this type of machine, but all of them have been open to criticism. Now, however, a new type of gasoline power shovel has been placed on the market which is a radical departure from the accepted designs.

In this machine, which has successfully passed its preliminary trials, all power is supplied from one slow-speed gasoline engine, and there are no motors, engines, or clutches on the boom. The application of the power for digging is most ingenious, all operations being controlled through two cables. At the knee of the boom is a shaft carrying two pinions and a drum of larger diameter. Two racks on the lower side of the dipper arm engage the pinions, while the two operating lines are fastened to the drum. One of these lines passes over a sheave near the top of the boom and then to the winding drums, while the other line passes to a sheave near the dipper, and thence, over the end of the boom, to the drums.

The dipper can be put through any motions possible with the steam shovel, even to the shaking of the dipper to free it of sticky material. The boom may be raised or lowered in the usual manner, while the swing is controlled by a separate clutch. The shovel is mounted on tractor treads and is self-propelled.



Gasoline-Driven Power Shovel Actuated by One Engine: The Dipper is Thrust into Digging Position by Holding Line A and Hauling on B, and Raised by Holding B and Hauling on A. Any Combination of These Motions may be Effected



Electrical Equipment Which is Installed at the Central Office to Operate the Measured Telephone-Service System: The Two Duplicate Time Clocks are Seen Above and the Pole-Changing Switches Below, Together with Meters, Knife Switches, Fuses, and Other Necessary Apparatus

PHONE SERVICE MEASURED LIKE ELECTRIC LIGHT

THE first metered telephone service in the world is now given in Everett, Wash., where about 6,000 subscribers are paying for just the amount of talking they do. The new rates, which are now on trial under orders of the Washington State Board of Public Works, are based on the time consumed in actual talking over the telephone, as gas, electricity, and water are metered. Under this system the service company asserts that it is possible to reduce the cost to 85 per cent of its subscribers and increase the capacity of its plant by 2,000 telephones without adding to the exchanges.

These changes are made possible through the development of a device known as a "telechronometer," which accurately measures the length of time each telephone is used by the calling party. Incoming calls are not registered. For more than a year the telechronometers have been tested, and last December they were ordered placed on all telephones in the Everett system. Just recently the work was completed, and the change made from a flat-rate basis to a "pay-for-what-you-use" system. The ceremony of throwing the switch that turned the current into the new system was witnessed by a large number of engineers, public-utility officials, mayors, councilmen, and others, from the Pacific Northwest.

Measured-Service Equipment Which is Installed at the Subscriber's Home or Place of Business, Showing the Recording Meter above the Telephone

Among other advantages of the telechronometer, the company

claims that it will discourage and probably eliminate "listening in" on party lines, as it will cost the eavesdropper money to take down his receiver and gather the neighborhood gossip; unnecessary and frivolous conversations will be reduced to a minimum, and the use of ten, eight, six, and four-party lines will be increased, because there will be less traffic on the lines.

Tests made with the telechronometer while the system was still on a flat-rate basis showed that 50 per cent of the subscribers used 78 per cent of the service at a cost of .64 cent per "telechrone," which is the term used for one minute of conversation. The other 50 per cent used only 22 per cent of the service at a cost of 2.27 cents a telechrone. Yet all paid the same flat rate for a similar class of service.

Telephone service is now given for as little as $1 a month, which entitles the subscriber to 60 telechrones a month. If he uses more than that amount he pays one cent a telechrone for it. Single-party business telephones that formerly cost $6 a month are now $5.25 a month, which entitles the subscriber to 600 telechrones, or almost 24 minutes of conversation, each business day.

The telechronometer is a little device located close to each telephone and registers the time consumed by the calling party, after "central" has made the connection. Registration is stopped the instant the receiver is replaced on the hook. No influence outside the control of the subscriber can cause registration.

The inventor describes the telechronometer as a train of gears that controls the dial pointers which register in tens, hundreds, and thousands. Movement of the meter is caused by a polarized relay, which operates as follows: When a subscriber removes his receiver from the phone and the operator has made the desired connection, current flows from the central battery to the telephone transmitter and the telechronometer begins to register, and when the receiver is hung up, the current is reversed and the meter stops registering. Thus the pointers on the dial measure the exact time of the conversation.

The apparatus at the central office consists of a duplicate pole-changing switch, each set being controlled by a standard time clock. The unit of time movement of the pole-changing switches for local service is 15 seconds, and the meter dials register one unit for every four current changes from the central pole changer.

The two big clocks located in the central office of the Everett system are guaranteed to operate with no more than 10 seconds of variation in 24 hours. Any defect in the meter would only cause it not to register, and the telephone company is willing to take this chance.

FOUR SETS OF HEADPHONES ON RADIO APPARATUS

Four sets of headphones, or receivers, can be attached to a new article of radio equipment which has recently made its appearance. The appliance is placed on a table, or stand, and an ordinary receiver held tightly on top of it by means of an elastic band. Rubber extension tubes are then affixed to its base, and an assembled quartet can "listen in" to the broadcasting.

Radio Apparatus Placed in Center of Table So That Four Persons can Listen to the Broadcasting

EXPERIMENTS IN PRODUCTION OF GERM-KILLING DYES

Great strides are being made, in England, in the production of various dyestuffs that are poisonous to some particular disease germ without being in any way injurious either to human beings or to any others. Proof that success is being achieved in this direction is demonstrated by the fact that at sewage works where the disposal of the sewage depends upon bacterial action, it is now possible by the use of a specific dyestuff to kill other microörganisms which are destructive of the purifying germs without injuring the latter. Similarly dyes have been produced which pick out and destroy disease germs in the blood.

SCRAPPING THE WARSHIPS OF THE U.S. NAVY

By H. G. Layton

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ALL the glamour, romance, and best traditions of the United States Navy are bound up in the dismantling and scrapping of the many units purchased by the Henry A. Hitner's Sons Co., of Philadelphia, and now being junked at its huge yards there on the Delaware River. From the old and tiny "A-1 Plunger" submarine, one of the world's first successful undersea boats, to the monitor "Monterey," built in 1887, and on through the list to the former queen of the navy, the battleship "Wisconsin," all functioned in the creation of history's second most powerful naval force.

The Limitation of Armament Conference at Washington restricted a completed or under-construction naval program of the United States from approximately 1,370,000 tons to 525,000 tons. This necessitated the scrapping or sale by the government of 845,000 tons of all types of its maritime defense to maintain the 525,000-ton first-line naval-strength ratio accepted by the United States as a signatory to the terms of the naval-limitation treaty.

The sale of this huge tonnage total from our naval list has created a new industry and thrown upon the market for purchase by the highest bidder hundreds of completely equipped fighting craft. The number runs into the hundreds, as it takes a great many mixed-caliber battleships of the 12,500-ton "Missouri" type and "Eagle" boats of 500 tons to balance capital ships, completed or under construction, of the 35,000-ton battle cruiser or predreadnaught types represented by the 33,190-ton "Tennessee."

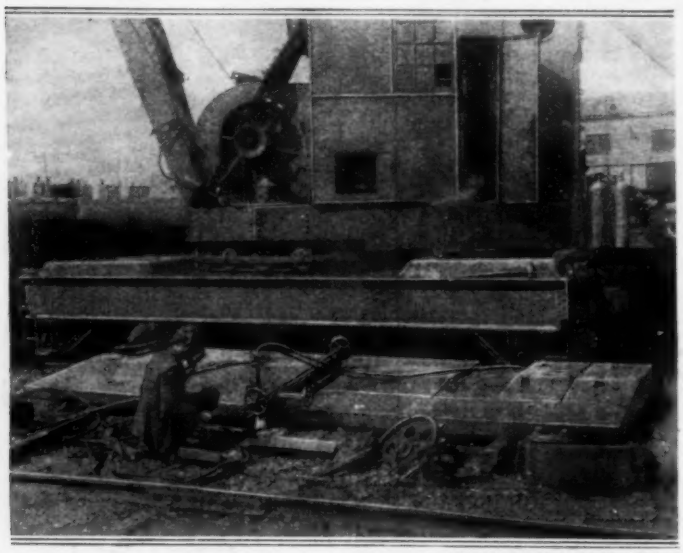
This new industry may be best presented by the methods employed at the Hitner yard when it bid successfully for a navy whose total tonnage and fighting strength exceeded that of the United States in 1910, or of Italy at the beginning of the World War.

Here, tied to the long docks and groaning protest as they strain at their hawsers, are the battleships "Maine," "Missouri," and "Wisconsin," for example, and, picking at random from the others, the once proud first-class cruiser "Columbia," and coast-guard battleship "Number Four," formerly the "Iowa"; the monitors "Ozark," "Monterey," and "Tonopah," and the destroyers, Eagle

boats, and other craft that are just numbers.

Powerful oxyacetylene torches wielded by masked and hooded gnomes are cutting through the 11-in. nickel-steel turret armor of the "Maine," while a giant 125-ton crane is snaking out of its barbettes one of the mighty 12-in. 40-caliber rifled guns that once maintained the principles of this federated republic.

Farther along the yard, the little sub with its paper-thickness shell is being ripped apart with chisels to the accompaniment of the Gatling-gun-like staccato of compressed-air hammers. The obsolete monitor "Monterey," modernized edition of Ericsson's gallant "Monitor," with its surface-flush deck, built, 35 years ago, by the Union Iron Works of San Francisco, is rapidly being converted into open-hearth billets, but its 10 and 12-in. rifles still grin menacingly through the turrets of its squatty superstructure, as they did in the early nineties when the "Monterey" was the most powerful battle craft afloat, and as a coast-guard unit was held by naval experts to be invincible. From it grew the double-turreted, 16-in., 25-mile range, super-rifled capital dreadnaughts of the "California," "Arizona," "Pennsylvania," and "Tennessee" types, for whom it dies that they may live.



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Strip of the Waterline Belt of Hull-Armor Plate, Weighing 25 Tons, being Cut with an Acetylene Torch into 25-Foot Lengths for Open-Hearth Furnace Billets

The little "A-1 Plunger" was the grandfather of the modern submarine cruiser "S-41" of proved success, that has eliminated it from the future navies of the world as "commerce destroyer" by the disarmament conference. Creature of the brain of J. P. Holland—Robert Fulton of the submarine—the early trials of the "A-1" were the subject of almost as much ridicule and scoffing as marked the first efforts of Fulton on the Hudson River, but the basic principles of the "A-1" are found incorporated, though modernized, in the "S-41," built nearly 25 years later.

Nothing can destroy the place in the history of maritime armament which these old fighting craft hold, or efface from the proud record of our navy the part which they played in its upbuilding, yet one feels a little tightening of the throat when he witnesses a huge piece of side armor go creaking aloft to be dropped upon a pile of scrap, or sees the oxy-acetylene torches cutting up the 12-in. rifles for junk.

But the process of converting our one-time defenses into peaceful uses must go inevitably forward. The armor is thrown into open-hearth furnaces, and emerges as one of the most valuable by-products of this big scrapping job. Its alloy content of nickel steel makes it adaptable to many peaceful uses, particularly in the automobile industry, into which most of it will find its way. Gray-iron foundries will purchase the small scrap resulting from the crumbling, by huge stone pile drivers with a 100-ton impact, of the almost human machinery which operated gun turrets, ammunition hoists, and refrigerating systems. After being treated in combination with low-grade iron ore, it will be recreated into engine beds, and frames of harvesting and other agricultural machinery. The most precious junk of all is the copper, gun metal, navy brass, manganese, bronze, lead, zinc, and navy compositions, which are sorted into their different grades and sold to metal dealers, and in some instances, as with the equipment from the "Maine," will take form in new ship castings, steam pumps, and propellers.

Complete destruction is not necessary in the case of all the craft. The hulls of some of the torpedo boats will undergo a transformation to adapt them to peaceful pursuits. This has already been done

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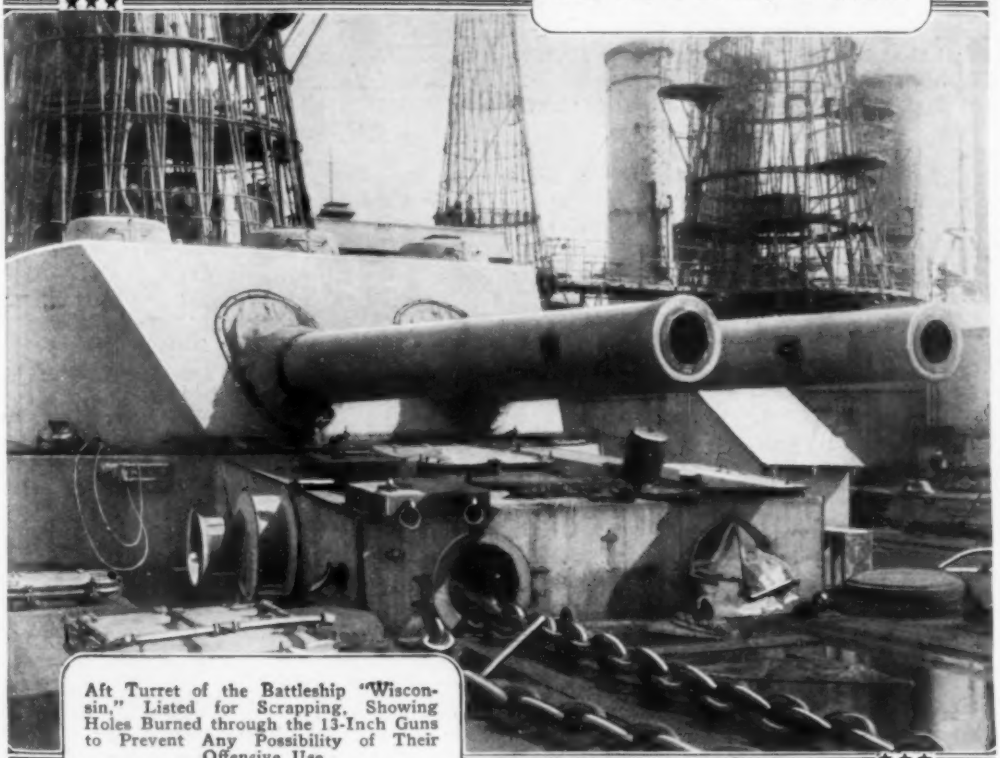
Huge Blackboard in the Office of the Chief of Naval Operations, on Which the Daily Movements and Locations of Every Ship in the Navy are Recorded



Aft Turret of the Battleship "Wisconsin," Listed for Scrapping, Showing Holes Burned through the 13-Inch Guns to Prevent Any Possibility of Their Offensive Use

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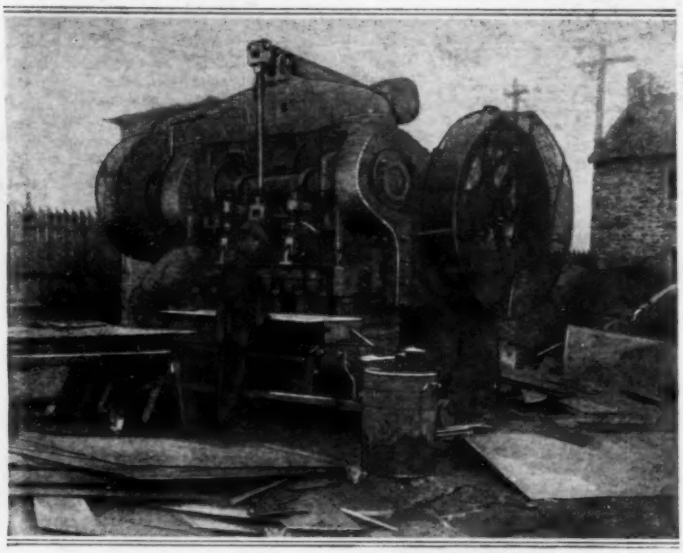
with the destroyers "Truxton," "Worden," and "Whipple," which will ply between the United States and Central America, carrying cargoes of fruit. Engined with kerosene burners, they are large cargo carriers, and of such light draft that they can navigate shallow rivers on high tide and lie off plantations for loading, thereby eliminating lighterage cost. Their clean lines give them great speed, which makes unnecessary the expensive refrigerating system used in slow fruit boats to the States.



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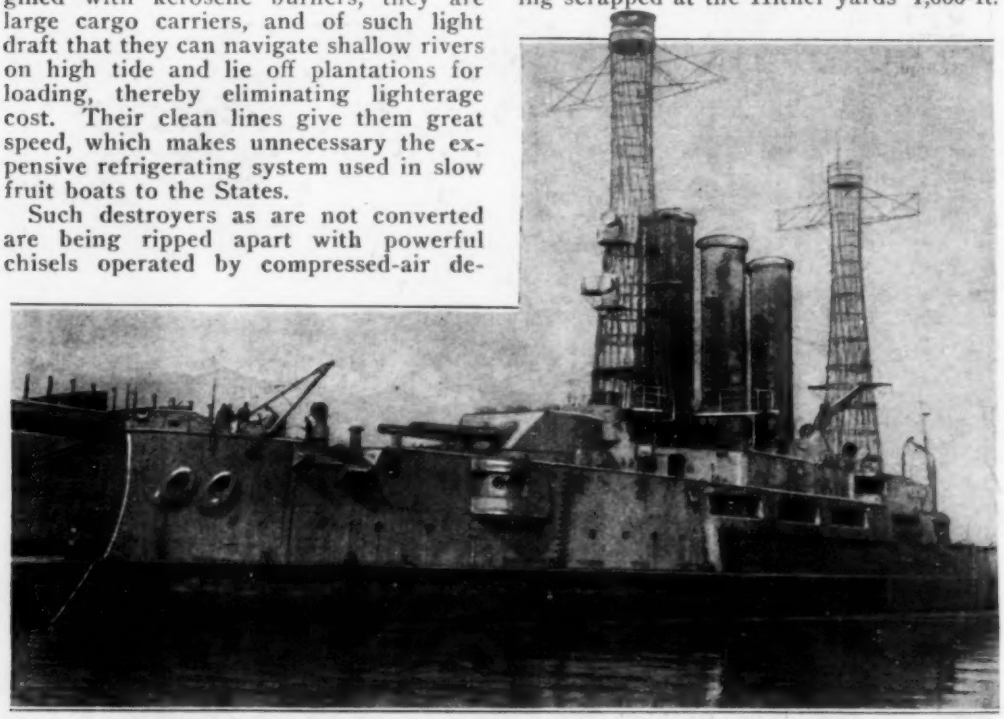
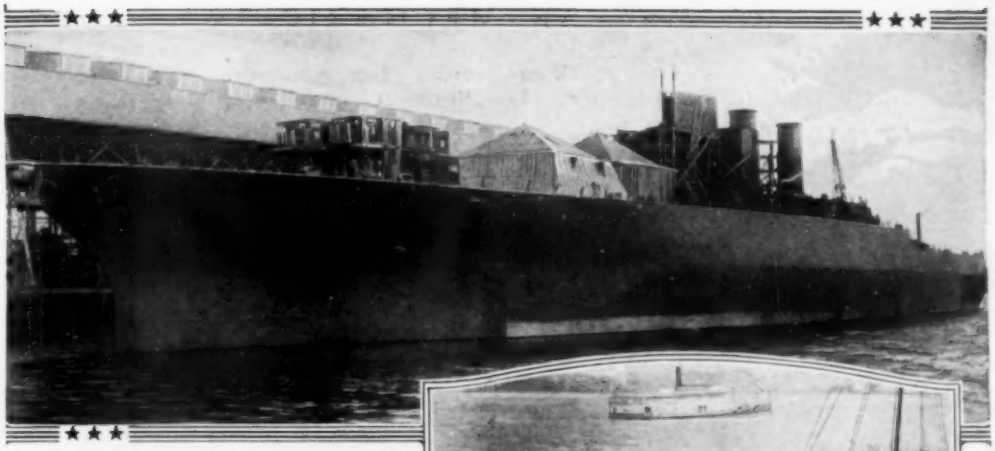
Torpedo-Boat Destroyer Bulkheads being Sheared into Standard Sizes for Use as Ordinary Structural Plates in Any Kind of Construction Work in Connection with Peaceful Industries

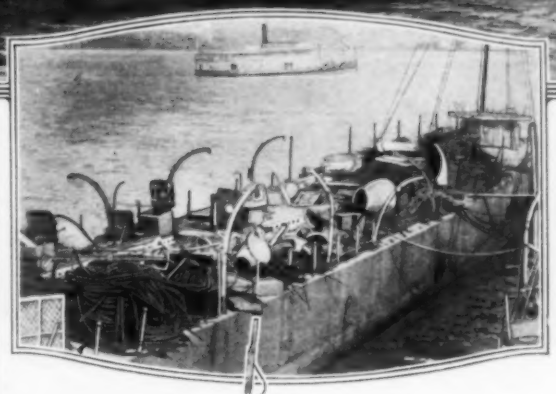
Such destroyers as are not converted are being ripped apart with powerful chisels operated by compressed-air devices. Destroyer armor is light, and huge 10-ton "crocodile" shears cut it into pieces that are remelted and rolled into various shapes adapted to structural steel, rails, and sheet plate.

Farther along the yard, two old English troop ships, the "Malabar" and "Hotspur," are lying in the berths once occupied by the international cup defender "Columbia" and Admiral Farragut's old flagship "Franklin," which were previously scrapped by the same firm. They are valuable junk, these British ships, being constructed of the purest wrought iron, which will be treated through several processes and converted into staybolts, and other forms requiring a rust-resisting metal. The list of the war craft that now lie at anchor in the Delaware River or already in process of being scrapped at the Hitner yards' 1,000-ft.



View of the Battleship "Maine," Tied Up in the Huge Yards of Henry A. Hitner's Sons Company, of Philadelphia, Ready to be Scrapped: It can be Seen That Part of the Waterline Belt of the 11-Inch Hull Armor has Already been Removed



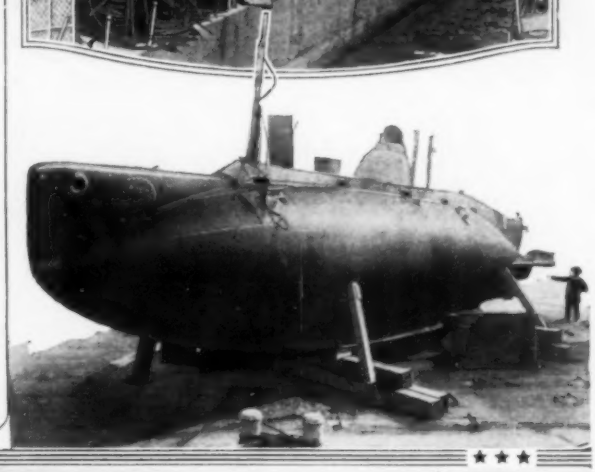


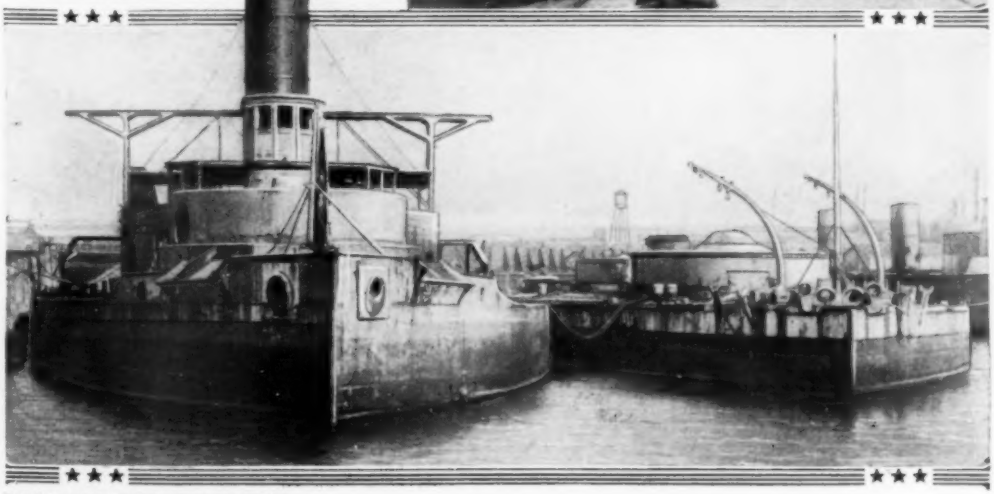
Above: Superdreadnaught "Washington," to be Scrapped Although Nearly Three Parts Completed. It was to have been Armed with Eight 16-Inch Guns in Its Main Battery, and Fourteen 5-Inch in Its Secondary Battery. Its Estimated Cost Was $20,000,000

Upper Right: In Another Part of the Henry A. Hitner's Sons Company's Yard Is This Partially Dismantled Torpedo-Boat Destroyer

Lower Right: The Holland "A-1 Plunger," Known as the Grandfather of the Submarine. This Product of the Brain of J. P. Holland—Inventor of the Submarine—Was the Precursor of the Modern Undersea Warship, Such as is Exemplified in the Powerful Submarine Cruiser "S-41"

Below: Modernized Forms of the Famous Ericsson "Monitor," the First Armorplated, Turreted Battleship Ever Built. These Two Coast-Defense Monitors are being Made Ready to be Dismantled





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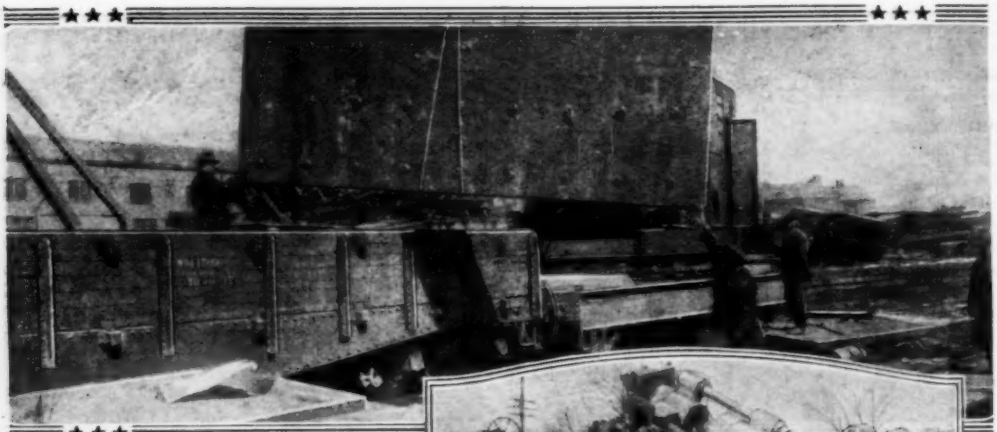


Above: A 40-Ton Plate of 14-Inch Hull Armor being Swung by a Crane from a Freight Car to the Ground in the Henry A. Hitner's Sons Company's Yard on the Delaware River, Philadelphia

Upper Right: Pile of Power Compressors Ready to be Scrapped with an Oxyacetylene Torch, Which will Cut Them into Billets for the Open-Hearth Furnace

Lower Right: Crocodile Shear Cutting Up a Plate of Protective Deck Chrome-Nickel Steel Armor from a Scrapped Torpedo-Boat Destroyer. This Valuable Alloy is Adapted to Many Peaceful Uses, Particularly in the Automobile Industry

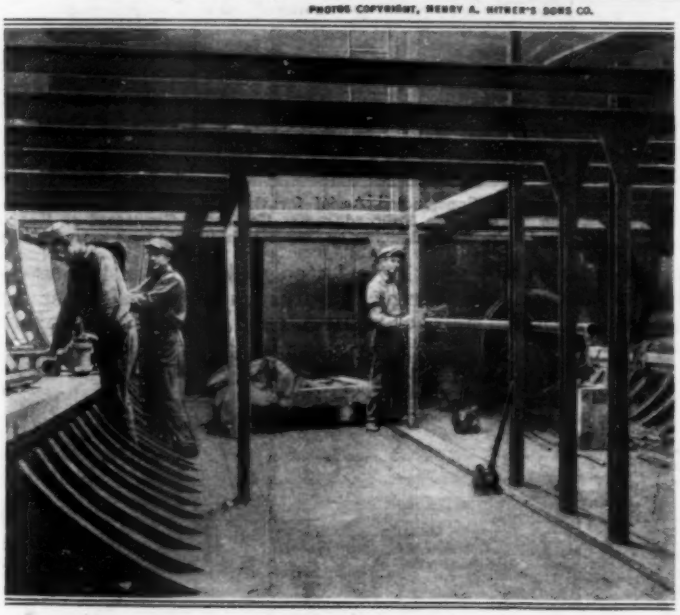
Below: Pile of Battleship Boiler Tubes in Another Part of the Yard Ready to be Broken Up and Then Thrown into the Furnace to be Formed into Billets

PHOTOS COPYRIGHT, HENRY A. HITNER'S SONS CO.

waterfront, include, in addition to those already mentioned, the cruisers "Detroit" and "Raleigh"; the destroyers "Stewart," "Bainbridge," "Perry," "Barry," "Dale," "Paul Jones," "Hull," "Lawrence," "Smith," and "Decatur"; the monitors "Canonicus," "Mahopic," "Catskill," "Jason," "Ajax," "Nachant," "Puritan," and "Miantanomah," as well as Eagle boats, submarine chasers, mine sweepers, and submarines.

Junking of ships on a scale of such magnitude as this has probably never before been undertaken at any one yard in the world, and certainly not here, although this yard has for 30 years specialized in that business.

PHOTOS COPYRIGHT, HENRY A. HITNER'S SONS CO.



Above: Close-Up of a 25-Ton Strip of 11-Inch Waterline Armor Plate from the Hull of a Battleship being Cut into 25-Foot Billets with an Acetylene Torch. Left: Interior of the Hull of the Torpedo-Boat Destroyer "Worden," being Converted into a Fruit Freighter to Trade between This Country and the West Indies

¶The trunk telephone between Sydney and Melbourne, Australia, has been duplicated by superimposing a duplex telegraph circuit upon each of the circuit wires. The new cable is 580 miles long.

PORTUGUESE AIRMAN HALTED BY WRECKED AIRPLANE

In an attempt to make a transatlantic flight from Lisbon, Portugal, to Pernambuco, Brazil, two Portuguese naval airmen, after covering more than three-quarters of the journey, were forced to stop at St. Paul's Rocks because of the wrecking of their seaplane. The start was made on March 30, from Lisbon, and the route followed was to the Canary Islands, thence to Cape Verde Islands, and to St. Paul's Rocks, where the flight stopped on April 18. St. Paul's Rocks are only about 500 miles from Pernambuco, the goal of the airmen, so one may judge how near they came to succeeding in their venture. They used only a small type of naval seaplane equipped with a 360-hp. engine and having a fuel capacity for only 18 hours' flying. This is the first attempt to fly the Atlantic from east to west in a seaplane, and while they fell short of their goal, the distance covered speaks volumes for the ability of the men and the reliability of their machine, as no extensive patrol was maintained to guide the airmen.

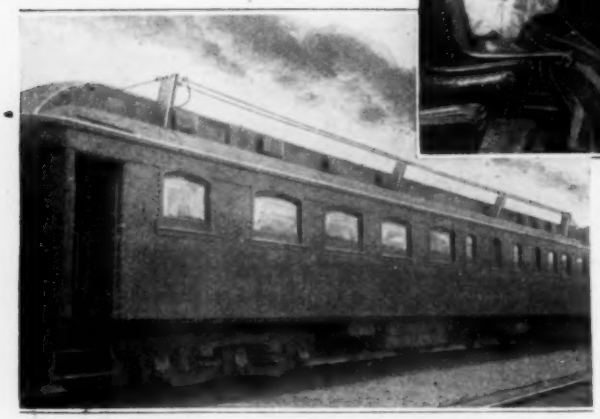
RADIO EQUIPMENT INSTALLED ON RAILROAD TRAINS

Radiophone Equipment Installed in a Buffet Car on the Lackawanna Railroad being Tested Prior to Its Regular Use on the Trains

Radiophone equipment has been installed on trains of two railroads in this country, namely, the Lackawanna, and the Chicago, Milwaukee, and St. Paul. Both these companies have converted buffet cars into virtual receiving stations, wherein the passengers can don headpieces and listen to the various broadcasting. Or, if the headpieces are not desirable, the occupants may be entertained by means of a loud-speaking horn, which is also connected in the circuit. The coaches are surmounted by special aerials running the length of the cars, and are of different construction, the Lackawanna using six wires, and the other road two, with the entire set being grounded through the axles to the rails. Although activities along this line have hitherto been more or less of an experimental nature, it is thought that the success achieved by these companies will induce other railways to provide similar amusement for the traveling public; also, that the next logical step will be to install transmitting apparatus on these trains for the further convenience of the passengers, who will then be enabled to send messages while en route.

Specially Constructed Aerial for the Radiophone Equipment on the Lackawanna Railroad Buffet Car being Connected on Top of the Train before Making an Experimental Trip with the Apparatus

Radiophone Installation on the Chicago, Milwaukee, and St. Paul Railroad



Aerial of Radiophone Equipment on Top of the Chicago, Milwaukee, and St. Paul Railroad's Buffet Car, Showing How Two Wires are Carried on Two-Foot Posts, the Full Length of the Car

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¶Wattle wood and the spent bark from the wattle-extract mills, are to be used in the manufacture of wrapping paper, according to the announced plans of a company in Natal, South Africa.

LIGHTHOUSE FLOATS FIVE MILES DOWN A RIVER

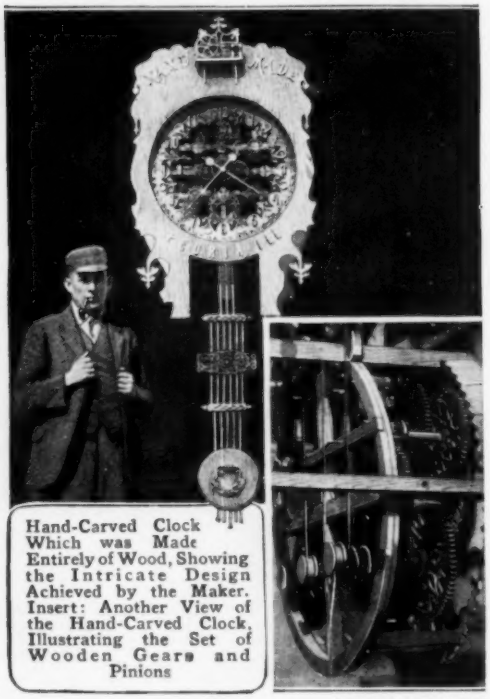
HOUSES in cities—even large ones—have often been moved from place to place, and now the same thing has happened to a lighthouse of quite respectable proportions. The structure is 55 ft. high, and weighs 80 tons. It was put aboard a large scow at its original site on the Niagara River, and was then towed five miles along the river to Grand Island, where it was put ashore. The inhabitants along the river front rubbed their eyes to see if they were awake, when they saw the well-known lighthouse floating majestically along the river.

A NEW CUSTOMER FOR THE GASOLINE-FILLING STATION

THIS little airplane has been designed in the search for a small machine that would be within the reach of all enthusiasts. It weighs only 500 lb., and is small enough to be kept in the garage. The claim is made that it can be manufactured for less than the price of a small automobile. Its flying speed is 100 miles per hour, and it is so small that it can land on, or take off from, a space no wider than the ordinary city street.

UNUSUAL HAND-CARVED CLOCK MADE ENTIRELY OF WOOD

A remarkable clock has just been completed by an ironworker of Peoria, Ill., in which all of the parts, even the shafts



Hand-Carved Clock Which was Made Entirely of Wood, Showing the Intricate Design Achieved by the Maker. Insert: Another View of the Hand-Carved Clock, Illustrating the Set of Wooden Gears and Pinions

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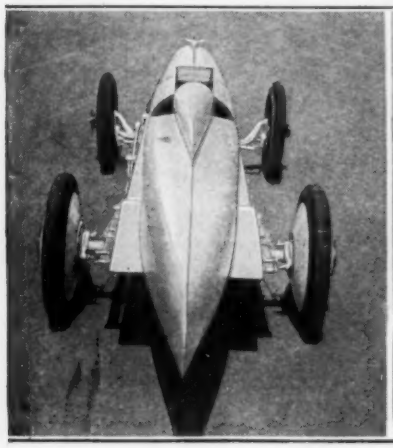
and fretworked gears, are carved by hand from solid pieces of wood. It has taken three years to make the clock, which not only tells time but also gives the day and month, weather prospects, and other information. However, its worth as a timepiece will depend on how the gears and pinions withstand climatic changes.

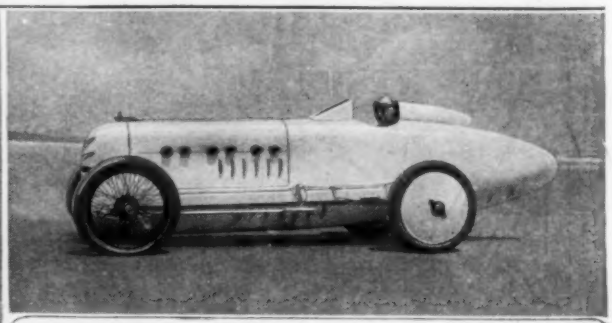
ELECTRIC-LIGHTING PROJECT FOR FRENCH VILLAGES

Shell-torn districts of northern France are being repopulated by returning natives, and these have made use of the miscellaneous electrical equipment left there by the different armies. Generators, driven by gasoline engines, have been put in use, and the cellars of ruined buildings, or the poorest wooden huts, are furnished with light and power. So great have been the benefits derived from these small and crude outfits, that the ministers of agriculture, finance, interior, and of the public works, have obtained the approval of the president for the establishment of an inter-ministerial commission. This commission will draw up a program for the distribution of electrical power in the rural communities and also endeavor to find a way for the proper financing of the project.

THREE-MILE-A-MINUTE MARK REACHED BY RACING CAR

On Thursday, April 6, over the Daytona beach course, Florida, the coveted speed mark of three miles a minute was reached by Sig Haugdahl driving a specially designed racing car. The official time for the measured mile, recorded electrically, was 19.97 seconds, which corresponds to a speed of 180.27 miles per hour. The previous record made on this same course was 24 miles per hour less than the new mark. The car used by Haugdahl was powered by a 250-hp. aluminum hydroplane motor, weighing only 610 lb. The body of the car is only 20 in. wide and is streamlined. Even the axles and all exposed bolts and nuts have received the same careful treatment.





Left: Rear View of the Specially Designed Motor Car Which Traveled at the Rate of 180.27 Miles per Hour, Showing the Unusual Lines of the Body. Right: Side View, Showing the Driver at the Wheel, and Displaying the Peculiar Bullet-like Streamline Design

COMMENT AND REVIEW

[These pages were printed April 25, 1922.]

JACKSONVILLE, Fla., has an active Association of Commerce, that does things well, but its members are even more proud of the Junior Association of Commerce, largely, but not exclusively, composed of young men who are sons of members of the parent body. These budding captains of industry last month scored a tremendous success in a "Made in Jacksonville" week. The event opened with a mammoth street parade, composed entirely of exhibits of things made in their own city. The largest auditorium in the city was packed with exhibits and crowded all week. In addition to local residents and the thousands of winter tourists in town, large delegations attended from down state, for the event was advertised widely in a very attractive, and therefore effective, way.

Enterprising Junior A. of C.

The few old men doubters who failed to realize the tremendous power of organized young men changed to enthusiastic boosters the first day, for the way the boys carried the enterprise over the top was something inspiring.

What these young men—most of whom are under 25—accomplished, is a demonstration of wonderful possibilities to the young men in other cities, and an example well worth following throughout the country. The Jacksonville juniors, who conceived and carried out the idea entirely on their own initiative, proved their mettle in a big success, both financial and otherwise, and their first effort has already become an annual event. If the seniors have already preëmpted the "made here" week elsewhere, there are other equally good things waiting development. 'Attaboy!

THE Portuguese have always been daring navigators, and still stand among the best sailors in the world. The attempted flight of two of them from Portugal to Brazil has been watched with interest from day to day by the entire world, which, within a few hours, knows of their departure or arrival at each station. It is to be hoped the wrecking of their seaplane at St. Paul's Rocks will not seriously delay the completion of their journey, for which a new plane is reported under way from Portugal.

Trans-Ocean Flights

In several countries, plans are under way for an airplane circumnavigation of the earth, and it is not unlikely the present year may witness at least the attempt to do so. The Pacific Ocean, of course, presents the longest "leg" of the trip, but even these severe conditions are not likely to delay the effort very long, nor discourage these intrepid trail blazers of the air. Deserts and other wildernesses of the earth are already being explored by airmen, who are discovering routes and means of entrance which have hitherto baffled caravans and horsemen. Before many years, the secrets of jungles and mountain fastnesses, which thus far nature has guarded so jealously, will be an open book and familiar to children in grammar-school grades.

THE province of the magician in these days is to amuse and entertain by an appeal to both the eye and mind. No longer is he an individual feared for the evil influence he was once supposed to exert. On the contrary, magic is one of the finest types of entertainment we have. To perfect himself requires the patient, unsparing practice of a lifetime, and the place of high regard and affection which the magician may attain was notably manifested a few weeks ago when Keller passed on into that greater mystery than any even he had known.

Magicians Deserve Protection

A mystery is something we cannot understand; with an explanation, the mystery vanishes and the subject of it immediately loses its interest and attraction. On several occasions, in our effort to bring to our readers the earliest information on all subjects, this magazine has explained and illustrated just how certain unusually baffling major mysteries were performed. These stories were acquired in what seemed a perfectly honorable way, having come in from paid contributors. We are so elated at getting these "scoops" that it never occurred to our editorial department that what we expected our readers would regard as enterprise, in reality was a most unfair and unjust thing to do. Not until Harry Houdini, president of the Society of American Ma-

gicians—1,000 strong—explained the matter, did we realize what an "exposure" meant to the performer. A major mystery is the product of the brain of some magician, to the perfection of which he often works for years, and in some cases has expended thousands of dollars in experimenting and building one set of costly apparatus after another. And when it is finally a success, and he hopes to receive the reward he so fully deserves, there is no possible way in which he can protect himself. The act cannot be copyrighted; neither, like an invention, can it be patented. To do so would involve a minute description of how it is done. He is therefore helpless to protect himself except by an appeal to the fair-mindedness of publishers to refrain from tearing down in one short article that which he has worked so long and hard to produce, and on which he must depend for the financial return to which he is entitled. The case is a most unusual one, for which we recall no parallel.

This magazine has already published its decision to refrain hereafter from describing how such mystery acts are produced, and we feel sure our readers will not only approve our decision, but join with us in the hope that all publishers will adopt the same policy; for whatever satisfaction the reader may obtain from this knowledge cannot compare with the interest and pleasure he would otherwise have enjoyed in witnessing a clever and scientific performance.

The Days of '76 and Now

BOSTON, be it said to her great credit, finds time in these whirlwind days to recall and suitably observe many of the anniversaries of great historical importance in the annals of our country. We would all be better Americans did we more frequently follow this example. The recent anniversary of the ever-thrilling ride of Paul Revere and William Dawes was observed by exercises in Faneuil Hall and on the Boston Common, and the ride itself was reënacted.

It is impossible to refrain from contrasting this event of 147 years ago with the facilities of today. Then, the breathless, hard-riding horseman was the only quick and certain means of communication. Today, either the telephone, telegraph, automobile, motorcycle, airplane, or wireless would transmit the alarm in a period of time ranging from a few seconds to, at most, 15 minutes, although the splendid spirit of patriotism in which the farmers responded then could not be excelled by anything which modern invention has yet provided, or ever will.

A Few Pay the Taxes

THAT the taxes which go into the government treasury are being paid in very large part by the comparatively few, is plainly set forth in figures compiled by the New York Globe, which claims that fifteen to twenty million persons failed properly to report their incomes in 1921. It estimates the amount which should have been reported, and was not, at the staggering figure of $46,000,000,000 during the past five years. Of nearly six and one-half million farmers—owners and renters—less than six per cent reported an income of over $2,000 in the year 1919, which was by no means a bad year agriculturally. Among the wage earners the percentage was only one-eighth of one per cent. The investigation showed very little disposition on the part of the rich to evade proper returns. Doubtless thousands of the smaller taxpayers failed to report through sheer inability to make out the income-tax report, which baffles even the best lawyers.

The present system, a relic of war times, is atrocious and should be changed to one which people generally can understand.

H. H. WINDSOR

UNVEILING OF MEMORIAL TO BOOKER T. WASHINGTON

A MEMORIAL to Booker T. Washington has been erected at the Tuskegee Institute, and was recently unveiled by Alvin J. Neely, president of the Tuskegee Alumni Association. During the ceremony he presented a gift of $75,000 from the association to the institute.

ODD DEPARTURE IN HEATERS USED IN SWITZERLAND

"Linear heating" is a term used by Swiss engineers and defines the method employed by them to obtain heat by means of electrical resistance. Instead of utilizing the coil of wire so commonly seen in this country in heating elements, they stretch the wire, tape, or band, in a straight line between the terminals. These conductors are then incased in iron pipes, or flexible coverings, and carried through the rooms, offices, or workshops, in much the same manner as hot-water pipes.

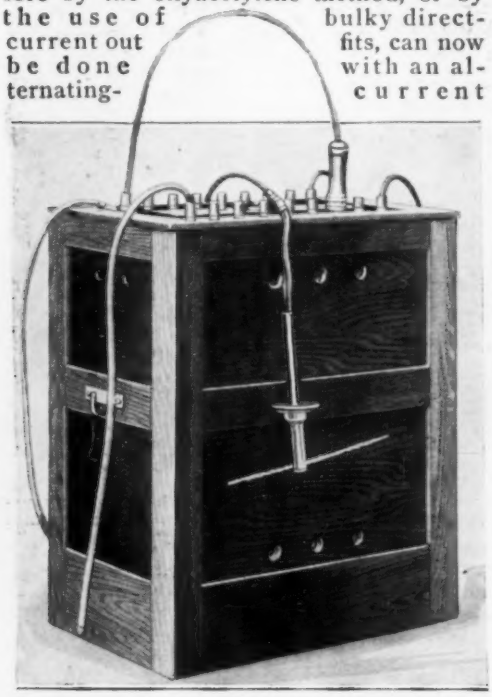
"WALKING BOOKS" ADVERTISE FREE PUBLIC LIBRARY

The librarian of Stockton, Calif., recently hit upon a clever idea for increasing the popularity of the public library. A display sign, 4 by 2 ft. by 15 in., was made in the form of a book and was carried about town by a boy who walked inside the sign. Messages to the public, describing features of the library, were printed on the sides, back, and inside "pages" of the book, which bore imprinted on it the name "Anne Othority" as its author.

This "Walking Book" Made of Sign Cloth Tacked on a Light Frame, is Carried about Town by a Boy, and Acquaints the People with the Attractive Features of the Free Public Library

ARC-WELDING MACHINE USES ALTERNATING CURRENT

Welding, usually accomplished heretofore by the oxyacetylene method, or by the use of bulky direct-current outfits, can now be done with an alternating-current machine. This contrivance, the invention of three Kansas men, has incorporated in it an effective heat control, enabling 14 different temperatures, which are obtained by the stepping-down process, or in other words, with an induction coil. Voltages ranging from 100 to 110 are maintained, while the amperage is reduced from 170 to 30. Thus the practical value of the apparatus is apparent—that of producing heat at a workable point without affecting the voltage—and almost any kind of welding can be performed, owing to the extreme flexibility of heat range.



Arc-Welding Machine Which Uses Alternating Current, Showing the Contacts on Top for Obtaining the Different Controls That Yield Extreme Flexibility of Heat Range

ENGLAND-INDIA AND AUSTRALIA AIRSHIP SERVICE PROPOSED

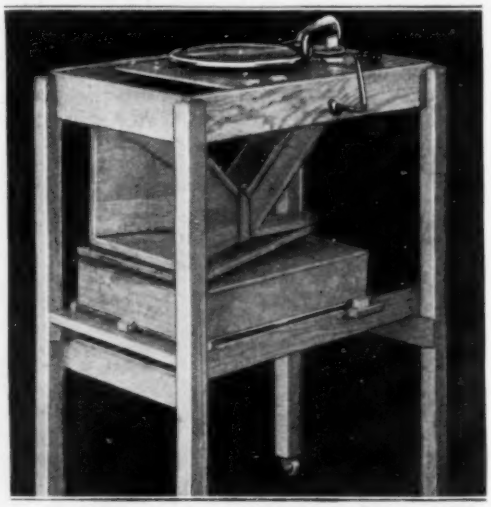
Plans are now being considered for the formation of a company to establish an airship service between England, India, and Australia. It is proposed to have a biweekly service to India, with a weekly extension to Australia, the service to be increased as necessity demands. The aim of the company would be a mail and passenger schedule of 5½ days to Bombay, while the present trip takes 17 days. The time to Australia would be 11½ days as against four to five weeks now required for the trip. The company would require no capital investment by the government, only a guarantee of interest.

NEW HYDROELECTRIC STATION IN VALENCIA, SPAIN

The second most important hydroelectric company in Spain has completed the construction of its station at Dos Aguas, which is the junction of the rivers Jucar and Gabriel, in the province of Valencia. When completed, the station will furnish 100,000 hp., and will greatly assist in supplementing the present inadequate power and light service of Madrid.

SPECIAL PHONOGRAPH SENDS CONCERTS BY RADIO

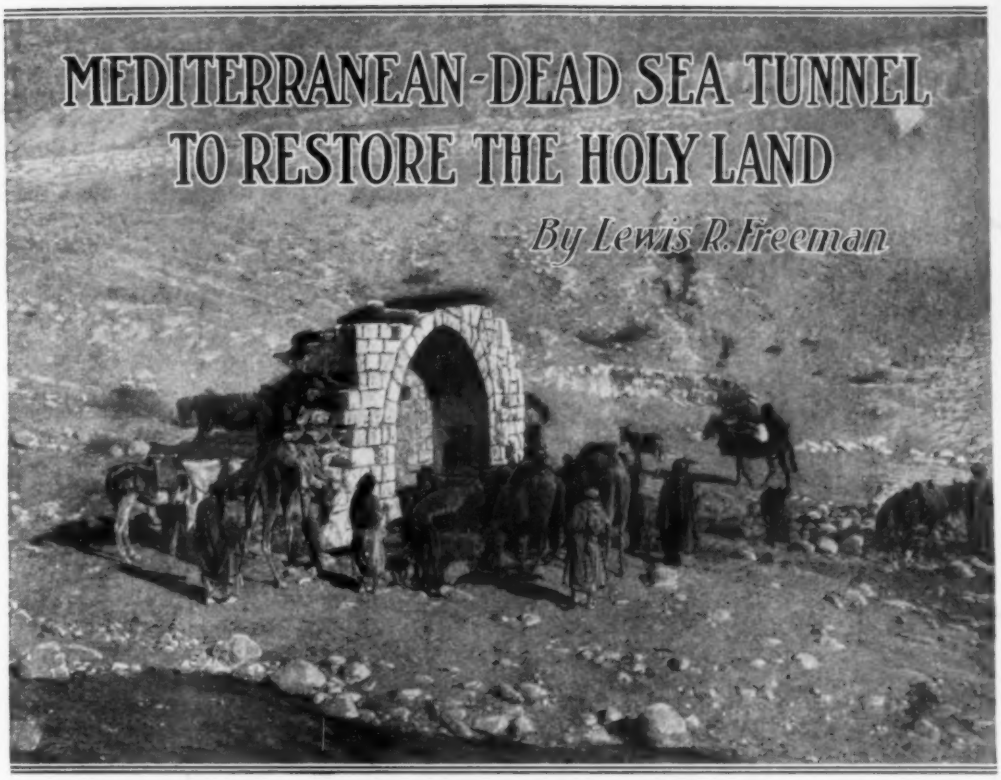
The fact that it is not always possible to employ expert musical talent for broadcasting wireless-telephone concerts has led to the development of a special phonograph for transmitting music. The tone chamber is larger than that of the ordinary phonograph and is supported on three posts which rest on a sound box similar to the body of a guitar. It is claimed that this machine is not only louder than the regular phonograph, but produces its tones more clearly and free from foreign vibrations.



This Phonograph for Transmitting Wireless Music Has a Special Tone Chamber Resting on a Sound Box, and Produces Exceptionally Loud, Clear Tones, Free from Interfering Vibrations

MEDITERRANEAN-DEAD SEA TUNNEL TO RESTORE THE HOLY LAND

By Lewis R. Freeman



The "Well of the Apostles": It Is from Such Sources as This That the Present Water Supply of Palestine is Obtained. The Primitive Method of Dipping Water from the Well in Jars Is Still in Vogue Here

WITH the Jews to the ends of the earth deeply stirred by the fulfillment of prophecies which lead them to believe that the hour of the founding of their New Zion is about to strike, and with many of them actually planning a return to the land of their forefathers, the question of the potential ability of that land to support a greatly increased population at once arises. The political division called Syria, roughly comprising a 200-mile-wide strip of the country at the end of the Mediterranean, had an area of 130,050 square miles and an estimated population of 3,326,160. Approximately one-third of this area was included in Palestine proper, and rather less than one-fourth of the population. Can a semi-desert region of this kind, which was hardly more than self-supporting at its best, give sustenance to a population of five or ten times the 700,000 souls that eked out a precarious existence there before the war? If not, the movement of any great number of people to Palestine, no matter by what motives impelled, would bring about an upsetting of the economic balance that could not but result in a great addition to the world's burden of suffering.

While it is probable that the Biblical description of Canaan as a "land flowing with milk and honey" was largely due to the impression of a number of rich oases made upon the minds of a people who had journeyed long over barren sands, yet it is far from being today the barren desert that it seems to the casual visitor. As a matter of fact, Palestine, which is in about the same latitude as southern California, has soil, topography, and climate strikingly similar to those of this most fruitful region of North America. Rich and fairly well watered coastal slopes, and deeply indented arid interior valleys, are common to both regions. In the matter of rainfall, Palestine, with its annual precipitation of from 20 to 25 in., is at a distinct advantage over southern California, which does not average much over 16 in. Probably this difference in rainfall is about offset by the fact that California, with higher and better forested mountains, has far better natural storage areas than Palestine.

There is no possible doubt that the Palestine of Biblical days, with a rainfall not greatly in excess of that of the present time, supported an almost exclusively agricultural population of many millions.

As there was nothing of the character of modern irrigation works at that time, this must have been made possible by the fact that the country was well covered with trees, so that the rainfall, which now rushes off in savage floods with the accompaniment of heavy erosive action, was stored in the earth. If almost complete deforestation was not brought about during the centuries of incessant warfare of earlier times, it must have come shortly after Turkish control was established. In no region long under the Star and Crescent have the trees survived in more than occasional groves and patches. Even Greece was almost completely denuded of its forests during the years it was governed by the Porte.

Nevertheless, although Palestine is a man-made rather than a natural desert, the problem of its reclamation is a more difficult one than that of many great areas — like the Imperial Valley, in California, for instance—which had never before known irrigation or cultivation. This is because there is no great river from which water can be diverted by a gravity flow, nor yet any readily available power which can be used in pumping. Neither coal nor oil are produced sufficiently close at hand to make their use in pumping plants economically feasible, and the absence of perennial streams of sufficient gradient and volume precludes the possibility of hydroelectric power in that manner.

This Old Donkey-Driven Grist Mill at Beirut-Jibrin will Be Only a Curious Relic When the Dead Sea Hydroelectric Project Makes Electric Power Available

Yet it is because some kind of power is indispensable to any extensive reclamation in Palestine, that these normally prohibitive limitations have not been allowed to bar completely the door of the future. One source of power, though a hitherto untried one, still remains—the sea. I do not mean tidal power, for the Mediterranean is practically tideless; but rather the utilization of the difference in elevation between the surface of the great Middle Sea and that of the deeply sunk valley of the Jordan. As the Dead Sea is almost 1,300 ft. lower than the Mediterranean, and as the supply of water from the latter is inexhaustible, it follows that the principal problem in connection with such a project will be an engineering one —the construction of the necessary works at a reasonable cost. Given the power that can undoubtedly be developed through such an installation, the restoration of Palestine to a productiveness that will support a population of many millions may be reckoned as an absolute certainty.

There are several extensive areas in the world that are below the level of the sea —notably in the western Sahara and the Colorado Desert of our own Southwest—but none where such a project as has now been put forward in Palestine could be advanced seriously. Yet, this boldest of modern engineering projects, unexampled though it is, is quite simple in its basic conceptions. A 37-mile tunnel through comparatively soft rock, a turbine installation to develop tens of thousands of horsepower, a transmission line to a great pumping plant 60 miles away, a couple of main canals to carry the lifted water, and the usual system of laterals and ditches—construct these at a cost that will not leave too heavy an interest charge against the land reclaimed, and Palestine can be made to provide "milk and honey," to say nothing of grain and fruit and sugar, for a population vastly in excess of that ruled over even by King Solomon. Without it, any attempt to found a New Zion through greatly augmenting the present population of Palestine would be almost certain to result in failure, if not in disaster.

No one with the least interest in hydroelectric development can ever have visited Palestine without remarking the power possibilities latent in the proximity of the Mediterranean to the Dead Sea depression, but the fact that the Turk was in control of the country put even a tentative study of the engineering side of such a project out of the question. The first time I ever heard it mentioned was in 1912, when a French engineer with whom I had crossed from Bagdad to Aleppo, pointed out the comparatively slight "divide" our train had surmounted in passing from the depression of the

Jordan, below the Sea of Galilee, to the level of the Mediterranean at Haifa. He said he had often discussed with his colleagues of the DeMorgan archæological mission the excavation of a tunnel and canal that would carry water from the Mediterranean to some point above the lower Jordan Valley, where a fall of a thousand feet or more could be obtained for a hydroelectric installation. He was of the opinion that most of the canal could be made an open cut, but that highly expensive aqueducts might be needed in maintaining the level across the deep *wadies* draining to the lower Jordan. The power generated, he said, could be distributed all over Palestine and used for pumping from wells now laboriously dipped from by buckets, and, if the thing were done in a big way, it might also be used for raising the water of the Sea of Galilee to the level of the fertile plains of Esdraelon and Kishon, and perhaps on to the broad, rich plain of Sharon. "However," he concluded, "no money could ever be found for such a project as long as the country is under Turkish rule; so why waste time talking about it?"

It was doubtless the fact that the blighting rule of the Turk in Palestine is over for good and all, that encouraged the eminent Norwegian engineer, Albert Hjorth, to make a detailed study on the ground for a project of the character suggested by my French companion. As Mr. Hjorth's plan calls for a tunnel from the Mediterranean directly under Jerusalem, I take it that his surveys have proved that such a bore would be preferable to the more or less open, but much longer, canal from a point near Haifa.

The "Well of Jacob," One of the Many Perennial Wells with Which Palestine is Plentifully Supplied: Irrigation Canals will Bring Water to This Country Where Water is Now Carried in Jars from Wells. In Localities Which cannot be Reached by Canals, Water will be Pumped from the Wells

This View of a Section of the Damascus-Beirut Railway Gives an Idea of the Barren Aspect of the Country through Which It Passes. It is Proposed to Electrify This Road with Power Generated by Water Flowing from a Spring

Doubtless the first thing an engineer would investigate in studying power development and irrigation for Palestine is the possibility of turning to advantage the fall of the Jordan between the foot of the Sea of Galilee and the head of the Dead Sea. As the latter is 1,292 ft. below sea level and the former 682 ft., the Jordan will be seen to have a fall of 610 ft. in its sinuous course of 185 miles. As the river is very winding, a canal of something like 60 miles in length would suffice to carry water to a point above the head of the Dead Sea. Unfortunately, the valley of the Jordan itself is so restricted that the comparatively small area of land commanded by such a canal, if built for irrigation purposes only, would not warrant the expense of its construction. On the other hand, if built as a supply canal to a power plant, the diversion from the Sea of Galilee would be so considerable that not enough water would be left to pump to the rich plains above. I do not find this project mentioned in the Hjorth report, but I set down these limiting considerations here because, offhand, the idea of a gravity diversion for both power and irrigation from the Sea of Galilee seems not unfeasible.

Construction Work Progressing on the Hydroelectric Power Flume Which will Carry Water from a Well That is Traditionally Believed to have Sprung from a Footprint of Abraham

The tunnel would leave the Mediterranean in the vicinity of Jaffa, long the port of Jerusalem, and said to be built upon the cliffs where Andromeda, chained up to be devoured by a sea monster, was rescued by Perseus. It would strike at once into a chalk deposit of the upper cretaceous era, and its whole course, it is believed, would be through comparatively soft limestones and marls. As this is the easiest kind of excavating, it is hoped that the tunnel, in spite of its unprecedented length, would not involve much more time in its construction than the short bores of Simplon and St. Gothard.

The size and the gradient of the tunnel are points that will be governed by the magnitude of the reclamation project—the area to which water will be pumped and distributed. Obviously, the greater the fall of the tunnel, the swifter the flow; and the swifter the flow, the smaller the diameter of the bore needed to provide a given quantity of water. Also, the greater the fall, the greater the head that will have to be sacrificed at the Dead Sea end. Thus, a fall of 2½ ft. to the mile would make a total drop in the 37 miles of 92½ ft., leaving an efficient head of about 1,200 ft. In practice, doubtless it will be found most economical to give the bore a much greater fall, allowing the increased volume of water to compensate for loss of head. Just where the most economical mean will be established will depend upon the power demand.

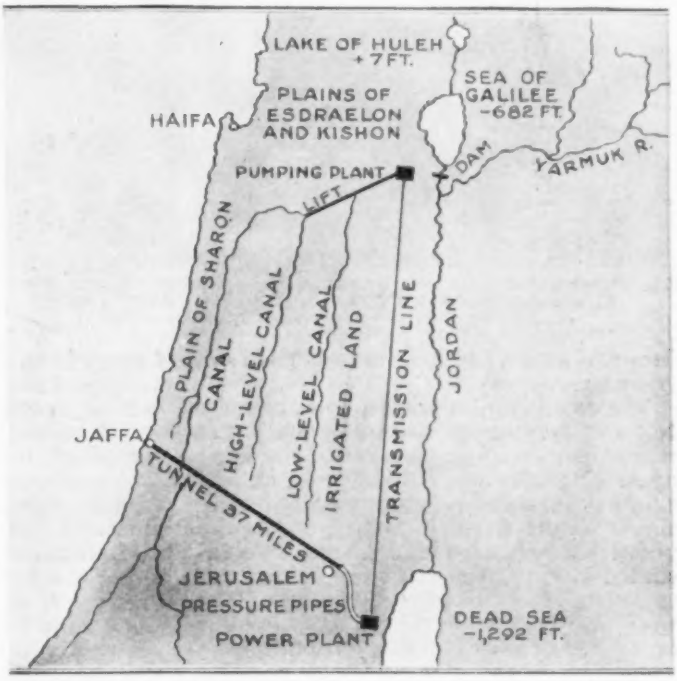
Perhaps the first point upon which an engineer would seek assurance in considering a project of this kind is the extent to which the rise of the basin into which water is discharged from the power plant would affect the efficient head. As the Dead Sea has no outlet, this, offhand, might seem to impose a serious limitation upon the amount of water turned into it. Fortunately, in this instance, the difficulty is one which provides its own remedy. Practically all of the water that flows to the Dead Sea is brought by the Jordan. But as the Sea of Galilee is but a collecting basin for the Jordan, any water pumped from the former for irrigation would reduce by just so much the flow of the latter into the Dead Sea. As it is probable that more water would be taken from the Sea of Galilee by pumping than would be added to the Dead Sea from the spillways of the hydroelectric plant, it follows that a fall rather than a rise in the surface of the latter is likely to take place. If this was considerable, it would, of course, mean that in time there would be a gain

rather than a loss in efficient head, but even disregarding any reduction of the flow of the Jordan, Hjorth figures that the evaporation from the furnacelike heat beating upon the Dead Sea would just about take care of the additional salt water flowing into it. It is estimated that the Dead Sea receives on an average of 6,500,000 tons of water a day, all of which (except its mineral content) is removed through evaporation. For one of his tunnels, Hjorth estimates a flow of 20 tons per second, or about 1,750,000 tons per day. For a short time this would have the effect of raising the level of the Dead Sea a foot or more a year. But with increase of surface would come increase of evaporation, and Hjorth figures that when the present 4,000 square miles of the sea would be increased to 4,800, the heat of the sun would suck up an amount equal to the whole additional flow, and that no further rise would take place. In any event, the danger of loss of head from a filling up of the Dead Sea is not one that need to be reckoned with.

The Sea of Galilee is the principal collecting basin for the waters of the lower Jordan. It is 13 miles long, with its greatest width 7½ miles. Its depth varies from 140 to 160 ft. Although its surface is 682 ft. below sea level, its waters are fresh, clear, and not heavily impregnated with minerals. They are not only free from alkaline or other salts that would render them dangerous for irrigation, but are even drinkable, being used by the inhabitants of Tiberias and the other villages upon the banks of the lake. The main stream of the Jordan heads upon Mount Hermon, at an altitude of 1,705 ft. Besides the Sea of Galilee, its only other important collecting basin is the Lake of Huleh, 7 ft. above sea level.

There are no accurate figures available on the discharge of the Sea of Galilee to the Jordan, but this is known to be sufficient for the irrigation of some hundreds of thousands of acres of land. Should it prove desirable to increase the mean annual flow, however, this can be readily effected by a dam at the foot of the lake to hold up the flood discharge of the rainy winter months and widen the storage area. Still further increase of water supply could be brought about by diverting the very considerable flow of the Yarmuk, which now empties into the Jordan some miles below the outlet of the Sea of Galilee, into the lake itself. Some further storage could also be effected by a dam at the Lake of Huleh.

Hjorth's plan calls for two main canals at suitable levels, roughly paralleling the general course of the Jordan. These would be supplied from the great pumping plant at the foot of the lake, and from them laterals would run to carry water to all of the extremely rich land in the valley of the Jordan. This has never been accurately surveyed, but it is known to run to many thousands of acres. A third and much larger canal at a higher elevation would start at an altitude somewhat above sea level and run to the southwest. This would carry water to the tens of thousands of thirsty acres of the magnificent Plain of Esdraelon, and the equally rich if somewhat less extensive area of Kishon nearer the Mediterranean. The final and



This Map Shows the Proposed Location of the Tunnel for Carrying Water to the Power-Generating Station, and the Location of the Transmission Line, Pumping Plant, and the Three Levels of Irrigation Canals. The Figures under the Names of the Bodies of Water Indicate Their Situation above or below Sea Level

culminating step, in the event the installation at the Dead Sea is made large enough to generate the necessary pumping power, would be to carry this canal to a point from which the great Plain of Sharon—the ancient granary of the Hebrews, Greeks, and Romans—could be commanded.

The Principal Fall in a Stream Coming from a Spring: Electric Power is Generated from This Fall, and is at Present Utilized to Operate Street Cars, and Light the City of Damascus

The details of the project do not appear to have been worked out to a point where more than an approximation of the acreage reclaimable has been arrived at, and this, of course, varies greatly according to the areas the water is carried to. If the plains of Esdraelon and Sharon are included in the scheme, this might well run to several hundred thousand acres. The water available from the Jordan drainage area is the limiting consideration, as the generation of enough power for pumping is merely dependent upon the size of the tunnel from the Mediterranean.

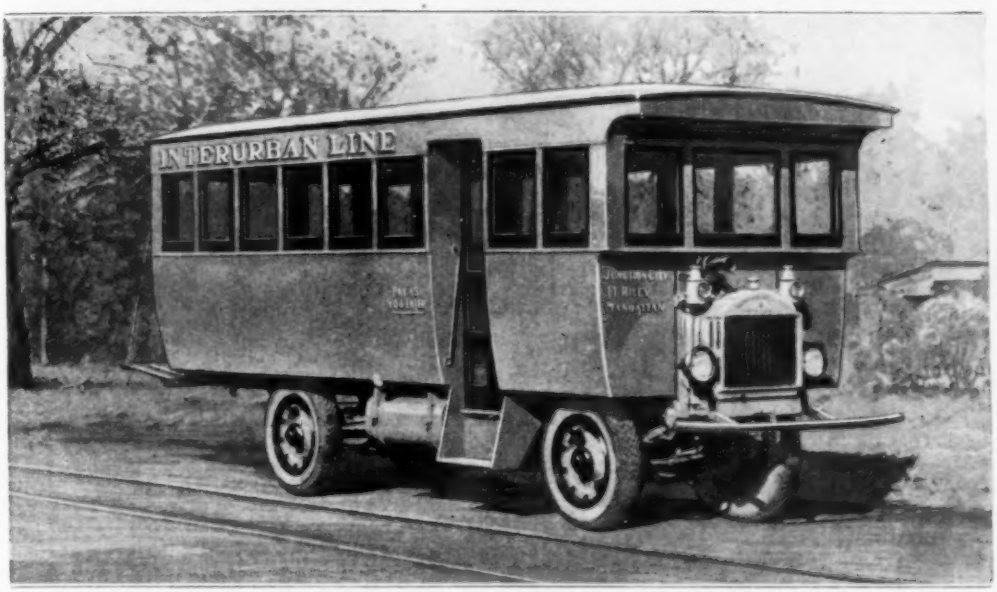
Scarcely less important in the long run than the Sea of Galilee project in restoring Palestine to fruitfulness, will be the utilization of a part of the power from the Dead Sea hydroelectric plant for pumping from wells. A land with so many perennial springs and wells as this can hardly fail to be underlaid with inexhaustible reservoirs of water that can be tapped by deep boring. There has never been an attempt to develop artesian water in Palestine, although the formation is such that it is more than probable that flowing wells would be brought in at no very considerable depth. But with cheap power, even good pumping wells would make possible the irrigation of many rich *wadies* and plains in the south and west of the country that cannot hope to be brought within any extensions of the Sea of Galilee project. Some of the best paying crops in California, Algeria, and India are raised by water pumped from wells under conditions no more favorable than those which should obtain in Palestine for this kind of farming.

Other uses to which Hjorth suggests putting the power from his Dead Sea plant are the production of fertilizer with nitrogen from the air, the exploitation of the vast deposits of asphalt, and for extensive works for the manufacture of salt from the sea water discharged at the spillways. All of these projects would dovetail effectively with the general scheme of restoration. In no place in the world have lands been tilled longer than in Palestine. Cropped to the point of exhaustion as certain areas are, the cheap and convenient fertilizer from the nitrate plant would be of the greatest help in bringing them back to full fruitfulness once water is available. The exploitation of the asphalt deposits, besides being an important industry in itself, may, as in Trinidad, bring the discovery of oil in its wake; and nothing could more effectively supplement cheap electrical power in Palestine than cheap fuel.

The advantages offered for the cheap and expeditious manufacture of salt promise to be more favorable than those enjoyed by any other spot in the world. The plan is to construct a horizontal canal which would take the brine discharged from the turbines and distribute it in a thin film over the broad expanses of sun-baked rocks bordering the Dead Sea. Evaporation would be almost as fast as in an oven. The residue could be collected for refinement as often as the incrustation on the rocks demands.

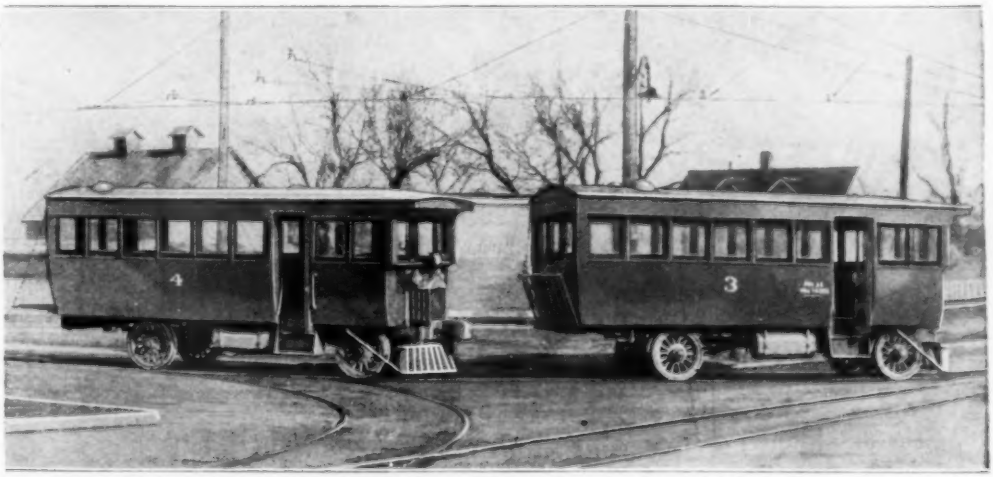
A comprehensive system of reforestation, carried out concurrently with the construction of the power and irrigation works, would in time act to conserve the by no means inconsiderable rainfall of the country, and ultimately make it possible to raise crops by irrigation from the augmented flow of streams long dry.

MOTOR BUSSES ON RAILS REPLACE STREET CARS

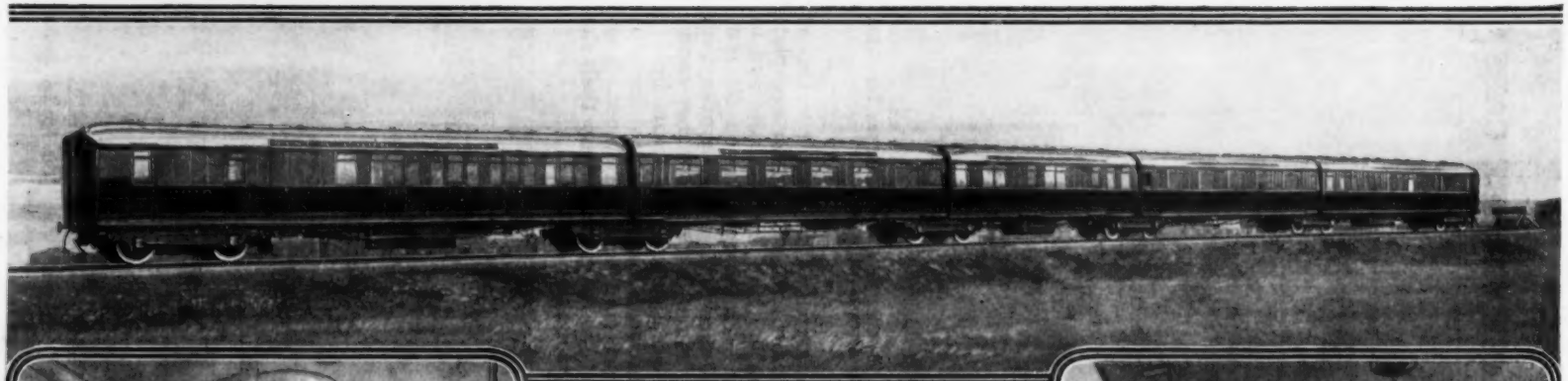


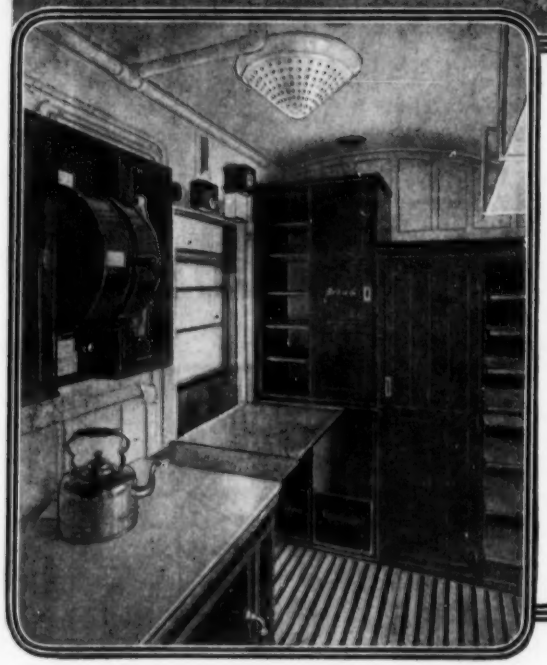
This Bus is Operated by the Street-Car Company on the Highway and is Used as a Feeder for the Interurban Line. It Runs on Schedule Time and Makes Connections with the Busses That Use the Rails

When the "jitneys" and motor busses first made their appearance, the street-car companies were their most bitter critics, but now they have adopted them for their own use as a means of reducing costs and furnishing better service. At Manhattan, Kan., they are used not only for interurban service but on the city streets as well. Special bodies were fitted on standard truck chassis, and steel wheels were substituted for the wooden wheels and rubber tires. The cars operate on schedule time and have given complete satisfaction, both to the company and to passengers. The cars drive on all four wheels and negotiate heavy grades with ease, even under adverse weather conditions, while, because of their lighter weight, the maintenance costs for cars and track are considerably reduced. They are said to operate more quietly than the street cars formerly used.



These Motor Busses Operate on the Street-Railway Lines and Replace the Electric Cars. The Special Bodies were Built on Standard Chassis, and Flanged Steel Wheels Replace the Wooden Wheels and Rubber Tires





DINER ON ENGLISH RAILROAD ELECTRICALLY EQUIPPED

INAUGURATING a new departure, the Great Northern Railway Co., in England, has equipped the kitchen of one of its dining cars with electrical cooking apparatus. Power for the apparatus is furnished by two generators, which are belt-driven from the axles of the trucks, each having a rating of 6 kw. In the kitchen, across one end, is the main cooking range and roasting oven, with a steaming oven above it, while over the latter, a grill and a hot-water tank are located. A boiling range having four hot plates, two 10-gal. boiling pans for vegetables, and a fish fryer, are also included in the installation, which has yielded such satisfactory results that the company is seriously considering similar equipment for other trains. The train has five cars mounted upon but six trucks, instead of the usual two trucks per coach. This method of suspension is said greatly to improve riding conditions, besides reducing weight, running expenses, and the initial cost of the equipment. Of these enumerated advantages, the most important, from the standpoint of the passenger, is the improvement in the riding. It is a well-known fact that the most comfortable part of a car is the center portion, and in these trains, there is no overhang of the cars beyond the trucks, as the ends are carried on a common truck center.

CONTROL "GOLIATH" AIRPLANE WITH AUTOMATIC PILOT

That the automatic stabilizer is destined to play an important part in controlling an airplane when flying through fog, is forecast by a recent test carried out in France. A Farman "Goliath" airplane, equipped with the same form of stabilizer that was used in making a flight across the English Channel some time ago, rose from the flying field through 4,500 ft. of dense fog into clear air above. After making several turns at this altitude, the engines were throttled down and the automatic stabilizer brought the airplane down in safety to within 150 ft. of the ground without help from the pilot.

SELF-HEATING SOLDER IRON WITHOUT VALVE OR PUMP

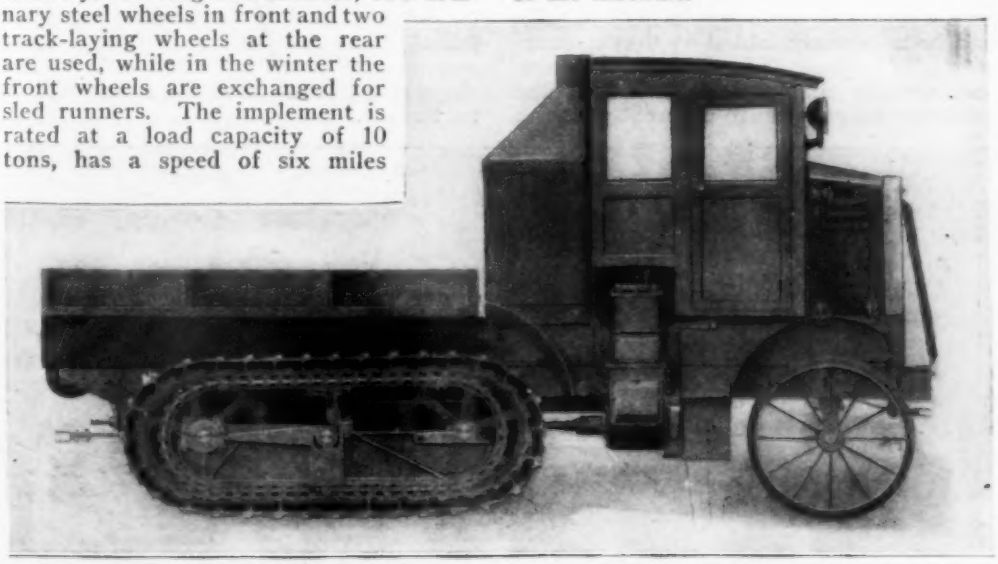
Combined blowtorches and soldering irons, the latter being therefore self-heating, have been made in various forms, but seldom without a pump to obtain air pressure. A pumpless and valveless blowtorch is made possible by the use of denatured alcohol in a very handy self-heating soldering iron now on the market. Inside its handle is a tube, the lower part of which is the reservoir for the alcohol, while the upper part is filled with asbestos

Above: Combined Blowtorch and Soldering Iron. Below: Handle Cut Away to Show Construction. Right: Solder-Melting Pot

packing. Just above the handle is a priming cup in which a small quantity of alcohol is burned, furnishing enough heat to generate gas under constant pressure in the handle. This gas blows through a pinhole into the burner part of the tool, onto the end of which is screwed the soldering point. Once started, the process is continuous until all the alcohol is consumed.

POWERFUL STEAM TRACTOR HAS TWO ENGINES

Two engines are built on a powerful oil-burning steam tractor, which has been designed for universal use, although considered especially adapted for the lumber industry. During the summer, two ordinary steel wheels in front and two track-laying wheels at the rear are used, while in the winter the front wheels are exchanged for sled runners. The implement is rated at a load capacity of 10 tons, has a speed of six miles an hour, weighs 8½ tons, and its wheelbase is 126 in. The two engines develop 30 hp. each, and are mounted, one on either side, midway between the front and rear of the machine.



Steam Tractor Which is Equipped with Two Engines, One on Each Side, and Which was Specially Designed for Use in the Lumber Industry of the North: In the Winter, the Two Front Wheels are Replaced with Sled Runners

AUTO SERVING TABLE STANDS ON RUNNING BOARD

Placed on the running board of any automobile, a new serving table can be quickly set up for the convenience of the hungry motorist. Lunches or refreshments can also be served on it at picnics or outings, and when not in use the table can be compactly folded so that it occupies very little space in the car. The construction is simple, and such that the table can be adapted to different cars.

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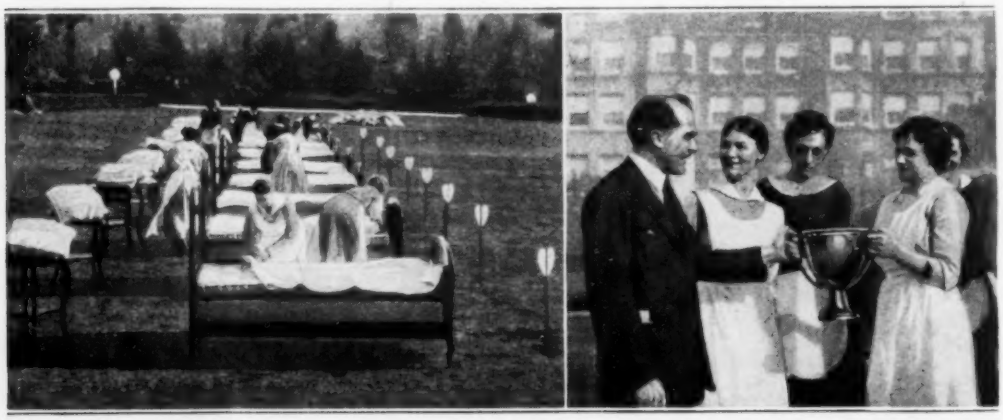
This Gives an Idea of the Convenience of the New Auto Serving Table Which, When Not in Use, can be Folded and Occupies Little Space in the Car

OLD CAPITOL AT WASHINGTON GIVEN TO WOMAN'S PARTY

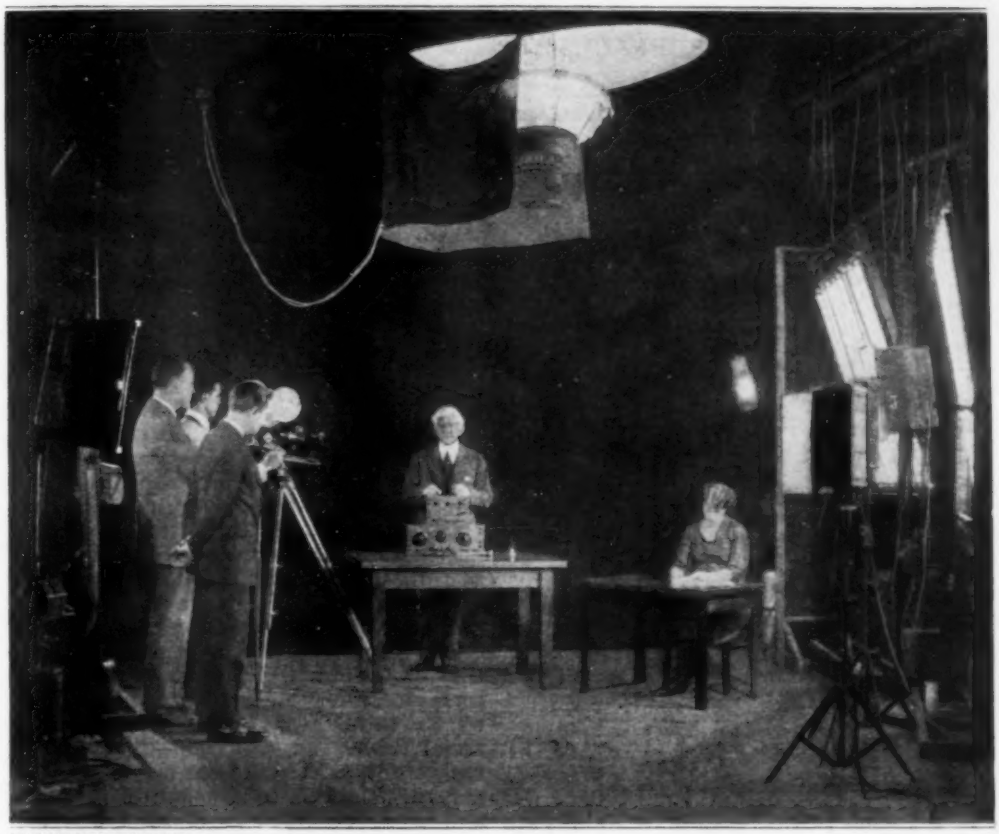
Standing on a terrace, surrounded by huge shade trees, and within distant view of the great dome of the present Capitol, at Washington, is the old Capitol, in which President Monroe was inaugurated in 1817, and where congress sat from 1815 to 1819. The old Capitol has been divided into three houses, and these are to be remodeled into one great mansion immediately following its rededication, on May 21, with much elaborate ceremony, to the use of the National Woman's Party. This has been made possible through the generosity of a member, who gave the $146,000 necessary for the purchase and reconstruction of the building. With the dedication of their new national headquarters the formal inauguration of the Woman's Party will be celebrated.

PRIZE CONTEST IN BED MAKING FOR HOTEL CHAMBERMAIDS

Of new efficiency contests there seems to be no end. Introduced at a fashionable California hotel for the amusement of winter tourists, the chambermaids' bed-making competition apparently takes first place for novelty. Lining up eight beds on the lawn of the hotel, the maids started at a given signal to make the beds assigned to them. Prizes were given not only for speed, but for the best-appearing bed, the neatest bed, the most securely tucked bed, and for a number of other points of perfection. A cup was later awarded the best of the bed makers, and she was declared California's champion in that event.



Left: The Novel Bed-Making Contest in Progress, with the Eight Beds of the Contestants Lined Up on the Lawn of the Hotel. Right: Awarding the Cup to the Champion Bed Maker; Prizes were Given Also to Some of the Other Competitors



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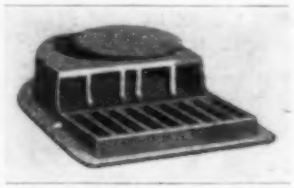
"Talking Pictures" in the Making: In the Center Is the Noted Actor, Frank Bacon, Delivering a Speech. At the Left Are the Camera Man, Promoter, and Director, While at the Right Is a Stenographer Who is Taking Down the Words of Bacon So That He can Later Repeat the Identically Same Speech

"TALKING PICTURES" MADE WITH AID OF RADIO

"Talking pictures" have been demonstrated as a practical possibility by Chicago men, who adopted the synchronization of radio and the motion-picture machine as the basis for their experiments. An ordinary picture is first enacted, then duplicates of this film are made and distributed to numerous theaters. The actors and actresses now repair to a radio-broadcasting station, where the original picture is thrown on a screen before them. As the story unfolds on the screen, the assembled cast again speak their parts, simultaneously with the action of the film. The projection machine in the station controls the starting and the operating speed of the machines in the theaters, so that, as the voices are broadcast, the different audiences are entertained with a synchronous blending of both action and sound, all of which makes the picture seem almost lifelike.

MANHOLE AND STREET DRAIN IN COMBINATION INLET

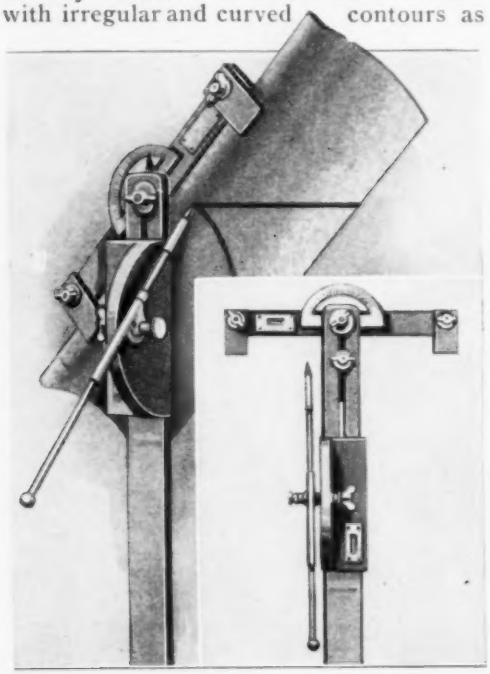
Combining a manhole cover and a street drain in one casting, is the result attained by a recent invention. The drain is installed in a bed of concrete, with the top of the drain hole on a level with the top of the curb. The cover is fitted securely into the manhole opening with a bar, which locks it in place.



¶"Radio with your shine," is the motto of a western bootblack who has installed a radiophone, together with a large sound magnifier, in his stand. Customers dropping in for the daily polish are entertained with broadcast concerts and news from a radius of 4,000 miles.

MITER-SCRIBING INSTRUMENT FOR IRREGULAR SURFACES

An ingenious patented device makes it as easy to scribe a miter on a surface with irregular and curved contours as



Instrument for Scribing Miters on Irregular Surfaces, Such as a Gutter or Eaves Trough: It can Also be Used for Laying Out Slopes at Any Required Angle

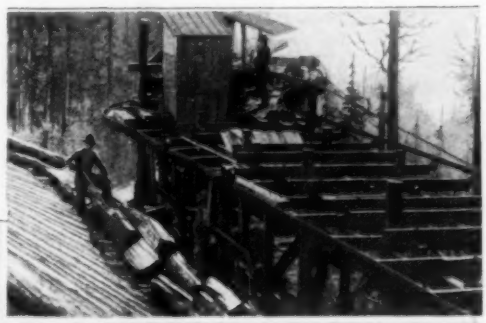
on a flat surface. The instrument will be particularly useful to tinners, and fitters of eaves troughs, and for scribing miters on gutters. It will also be useful to woodworkers, particularly to cabinet and pattern makers. In addition to scribing miters, the instrument can, of course, like any other of its type, be used for laying out slopes at any required angle, or as a simple straightedge.

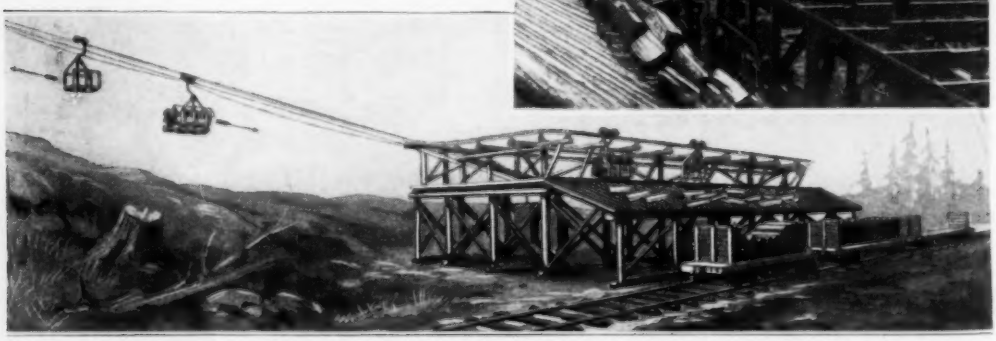
COPPER-SULPHATE WATER IS TIMBER PRESERVATIVE

In some of the western mines the water that is pumped from the mine contains a considerable amount of copper sulphate, and experiments have shown that this acts as a preservative in protecting the mine timbers against decay. Timbers which have been allowed to soak in this mine water for two or three weeks, sometimes outlast three sets of untreated timbers.

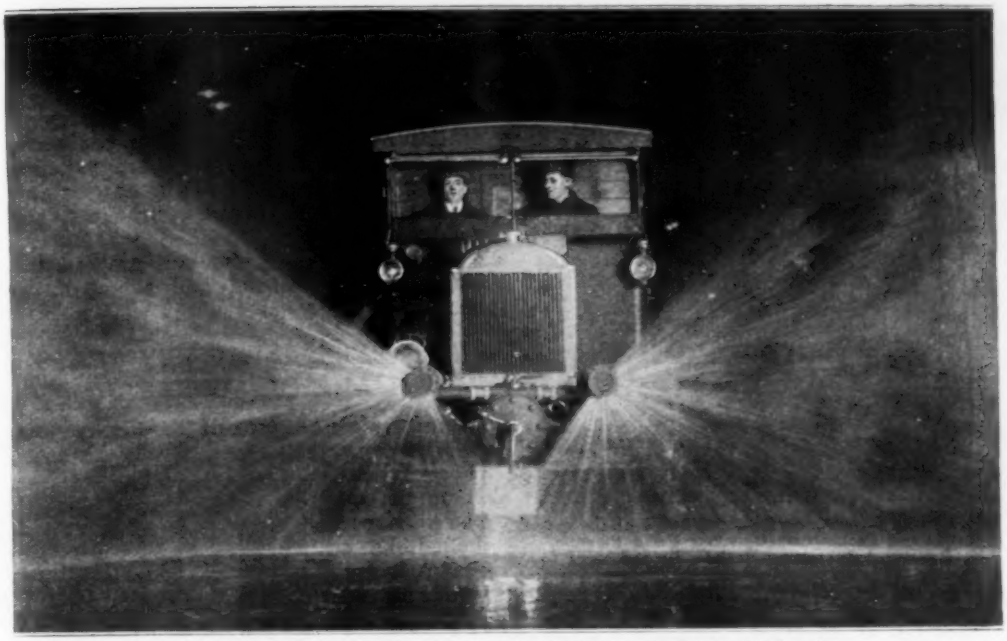
AUTOMATIC AERIAL CONVEYOR FOR SHINGLE BOLTS

Among the cedars of a mountainous locality in British Columbia, the engineers, in connection with a shingle mill, have built an ingenious conveyor for the shingle bolts, or bundles, that is entirely automatic. The conveyor has a length of three-fourths of a mile, and there is a difference of 900 ft. in elevation between the heading where the bolts are loaded onto carriers and the terminal where they are automatically dumped on a platform, for reloading in railroad cars. Between these two points are stretched aerial cables, on which the carriers run with trolleys. The loaded carrier is automatically locked to the haul-back cable, and in descending, its accumulated momentum is sufficient to return an unloaded ascending carrier, and also to run a small electric-lighting plant.





Automatic Aerial Conveyor with a Carrier Loaded with Shingle Bolts, Shown Descending and, by Force of Gravity, Driving Upward an Unloaded Carrier, as Indicated by Arrows: In Foreground Is the Dumping Platform for Reloading onto Railroad Cars. Insert Shows a Loaded Carrier Leaving the Heading

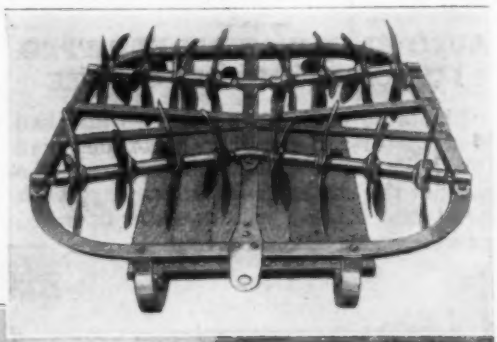


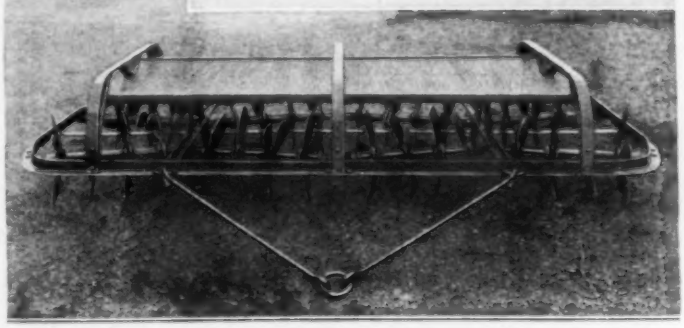
LONDON'S MIGHTY MIDNIGHT MOTOR STREET WASHER

FOR many years, every night as the clock strikes twelve, every street in the West End of London, England, has been flooded and scoured with water. Formerly this was done with hose and sprinklers. Now it is being done with a motor street washer that has sprinklers mounted on the front of the powerful car, which throw the water in great streams to a distance of from 25 to 50 ft. The machine can be used also as a first-aid fire engine, as it will throw a jet of 175 gal. at 100-lb. pressure. The illustration—a night view—shows the machine operating as a street washer.

MACHINE PLOWS AND HARROWS SOIL IN ONE OPERATION

A harrow is now being manufactured which, the makers claim, does the work of the ordinary plow and the disk harrow in one operation. In place of disks it has knives, which cut and pulverize the soil to a depth of six or seven inches. These knives are shaped like boat propellers, which gives a rolling effect and leaves the ground well plowed but smooth and even on the surface, so that a single trip with the machine over a field will give sufficient preparation for seeding.



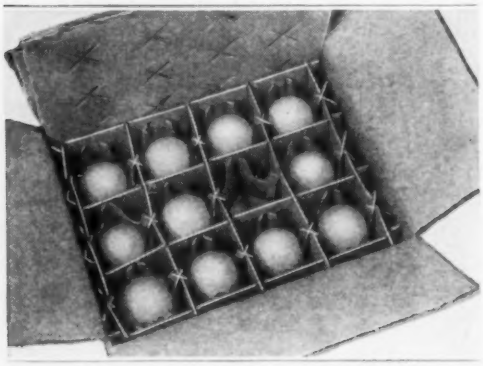


Above: Bottom View of the Harrow Resting on Its Skids, Ready to be Moved to the Next Field. Below: In Operation, the Propeller-Shaped Blades Cut and Turn the Soil, and Leave a Smooth Surface

¶According to recent announcement, the Japanese are producing, from the inner bark of the mitsumata plant, a good grade of vegetable leather which is said to be almost as tough as the so-called French kid.

CARRIER FOR SHIPPING EGGS STANDS ROUGH HANDLING

Because of the enormous loss occasioned in shipping eggs, the problem of a design of an efficient carrier is a fertile field for research. As hens do not work to any standard, the carrier must have a certain amount of flexibility, and yet be rigid enough to protect the fragile contents. In a recently patented carrier, diagonal strips of cardboard, placed inside the usual rectangular openings, hold the eggs in individual pockets which are protected from the shocks received in shipment.



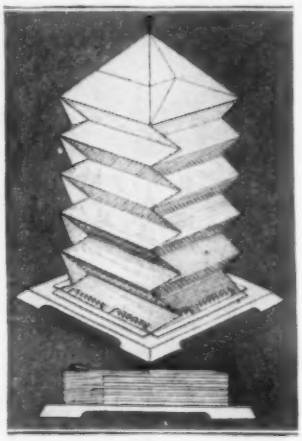
In This Egg Carrier, the Diagonal Strips of Cardboard inside the Rectangular Openings Form Flexible, Individual Protecting Pockets for the Eggs

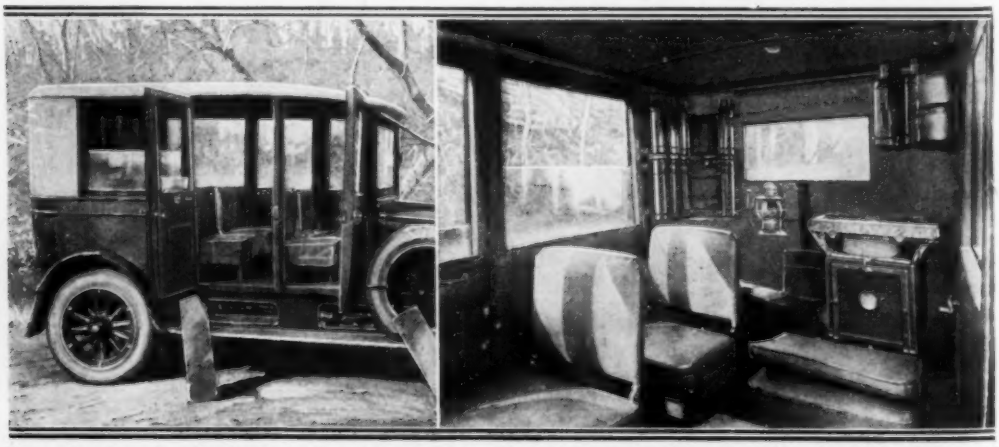
AUTO ELABORATELY EQUIPPED FOR CAMP AND OUTING USE

Elaborate equipment has been installed in a motor-car camping outfit designed and built for a Philadelphia man. The body of the car has wide doors fitted with locks, and all the windows are operated by a mechanical locking arrangement. The interior is finished in gray art leather, and has folding, or removable, seats for day use, while at night four canvas hammocks can be swung. Inside the machine, at the rear, is a marine-type cookstove with burnished sheet-aluminum paneling around it, and which has a copper fuel tank. Numerous shelves, brackets, and compartments are provided for lantern, vacuum bottles and jars, sugar, spice, tea, and coffee containers, and other outing necessities.

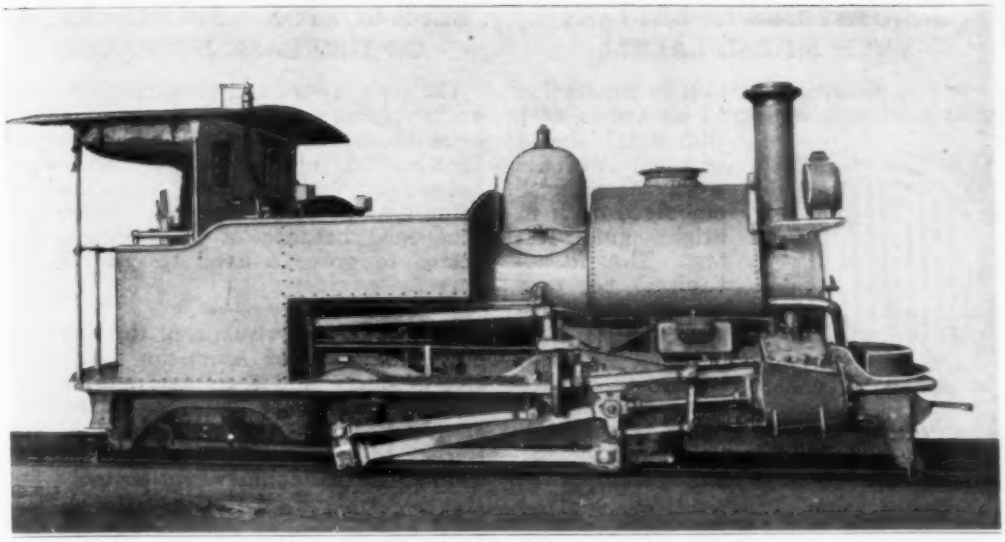
SANITARY PAPER FLY TRAPS MADE ORNAMENTAL

Sanitary on account of its effectiveness, and not unsightly, is a newly patented paper fly trap. It is collapsible on a dished base so that it is convenient for storage or shipment. It is made of decorative paper, and it expands into a cage, ornamentally shaped, with a conical top of lighter color than the bottom, so as to attract the flies upward. The flies enter the trap through small openings at the base, whither they are attracted by tempting food. The trap may be suspended from the top or stood upon its base.





Motor-Car Camping Outfit: Left, Exterior of the Specially Designed Machine, Showing the Wide Doors and Numerous Windows, Right, Interior, Showing Cookstove, Vacuum Bottles and Jars, and Other Equipment



This Special Locomotive, Used in Connection with the Plans for the Ascent of Mount Everest, Is Remarkable for the Small Diameter of Its Driving Wheels and Its Short Wheelbase, and Also for the Fact That the Fire Box is Made of Copper

LOCOMOTIVES OF STRANGE TYPE IN HIMALAYA MOUNTAINS

Special locomotives made in America have played a highly important part in the plans of the British expedition to ascend the world's highest mountain peak, Mount Everest. To reach the present headquarters, the expedition's materials and supplies were conveyed over the Darjeeling-Himalayan Railway, on which several of these special mountain-climbing locomotives have been placed in operation.

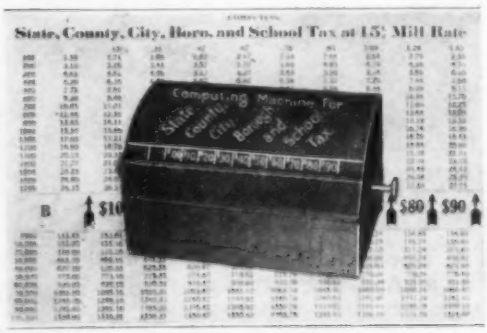
These locomotives were built to the individual specifications of the railway company. They were designed to withstand the severest strains. One peculiar feature is the copper fire box; another, the small driving wheels, having an outside diameter of 26 in. The wheelbase is only 5 ft. 6 in. Soft coal is used for fuel, the fuel capacity of the tender being 1,680 lb. The total weight of the engine is 36,250 pounds.

CHEMICAL PROCESS CONVERTS SAWDUST TO CATTLE FOOD

A chemical process for converting sawdust of the soft woods into a carbohydrate food for dairy cattle is now being developed at the Forest Products laboratory, at Madison, Wis. Preliminary manufacturing and feeding tests indicate the success of the process. This would mean turning much of this waste product into profit.

TAX-COMPUTING MACHINE HAS CHART FOR ANY TAX RATE

Tax calculation is made easy by the use of a simple computing device in connection with specially designed charts. With the turn of a small handwheel it shows instantly, through a slot for the purpose, the correct amount of tax, or any other valuation, on sums of money from $10 to $10,090. The charts are figured for different millage from 4 to 35 mills. All that is necessary is to put the chart for the required mill rate in the machine, and turn the handwheel until the amount to



Computing Machine for Telling Instantly the Correct Amount of Tax at Any Rate, from 4 to 35 Mills, for Each of Which a Special Chart has to be Placed in the Machine

be valued reaches the left-hand end of the slot. Opposite that will be displayed the required valuation, or taxation. It not only saves time and labor, but also eliminates the human liability to error.

SALUTATIONS IN LETTERS WITH METAL LABELS

A very snappy salutation in connection with a letter is conveyed by means of a thin metal label, 1 in. square, with the word "Greetings" embossed on it in bright gold letters. This is attached to one corner of the paper, and is held there by two small triangular catches bent against it. The greeting is good all the year round, and is used by business concerns to take the chill off formal letters.

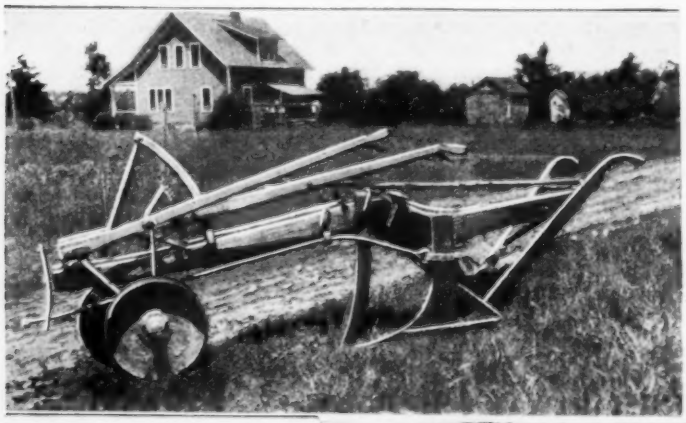
BLUE COTTON NOW BLEACHED TO INCREASE ITS VALUE

Cotton growers and manufacturers will be interested to learn that a method has been discovered whereby the bleaching of blue-bender, blue-Texas, or blue-stain cotton, is a practical possibility. The redemption of this product, heretofore cheapened because of its color, is expected to prove a boon to planters all over the world.

¶As a means of visualizing the methods of manufacture of American machinery and products, and their use, motion-picture films are to be made by the Bureau of Commerce in coöperation with the Bureau of Mines. The films will be distributed in this country and abroad.

TRACTOR-DRAWN BRUSH PLOW FOR LAND CLEARING

Breaking down and burying dense brush growths under the furrow slice may seem impossible, but this feat is successfully performed by a recently invented brush plow, which is drawn by a powerful tractor. The plow has an arched beam that increases the clearance from the ground 8 in. over that of the ordinary implement, and enables it to bury in the furrow standing brush of any size that the tractor is able to override. It is claimed that the outfit will actually break down growing brush, and small trees up to 15 ft. in height and 3 to 4 in. in diameter, covering the whole with earth. Land-clearing experts, judging from lately conducted tests, expect that the new plow will revolutionize present-day methods. Undoubtedly, it will greatly speed up the work of clearing brush-covered land, and prove invaluable to settlers engaged in this labor. The development of the brush plow is the last step in the mechanical clearing of cut-over land.



The High-Arched Beam of This Original Brush Plow was Hewn from the Trunk of an Oak and Reinforced with Iron Bands

The Tractor-Drawn Brush Plow in Operation: Because of the Extra-Large Clearance in the Throat, the Brush Plow can Turn Under Any Standing Growth That the Tractor Is Able to Override

TERRIFIC BOILER EXPLOSION ON LARGE FERRYBOAT

The boiler of a ferryboat that plied between Port Huron, Mich., and Sarnia, Ont., burst with terrific force on March 26, last, while the boat was lying in the Black River. The shell of the boiler was hurled 100 ft., and landed on a house, which was completely destroyed, the red-hot coal in the fire box igniting the neighboring houses, and causing much damage. The hull of the ferryboat was torn to pieces, and the fireman and engineer were buried in the wreckage. Two deckhands were hurled 25 ft. to their death, and besides these four men killed, there were 17 persons injured.

Wreck of the Ferryboat After Its Boiler Exploded: In the Background Is the House upon Which the Shell of the Boiler Landed

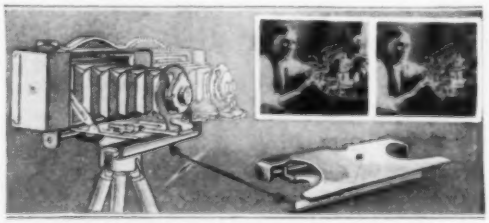
View of the Shattered Hull of the Ferryboat Lying in the Black River, Michigan, Showing How Completely It was Wrecked When Its Boiler Exploded

DRIVE RADIO GENERATOR WITH SINGLE-BLADE PROPELLER

In the effort to eliminate head resistance and produce a clearer and more constant tone for radio transmission from airplanes, a generator driven by a single-blade propeller has been tested. This generator is carried on a special mounting on the side of the fuselage, and preliminary trials indicate that better results may be had with this style than with the older styles of generators.

SIMPLE CAMERA ATTACHMENT FOR STEREOSCOPIC VIEWS

The amateur photographer who has taken pictures and later been disappointed by the flat appearance of the prints, can now arrange to take stereoscopic views with his regular camera. A simple attachment can be fitted on the tripod which holds the camera in correct positions for taking the two views of the object necessary for producing stereoscopic pictures.



This Simple Attachment, Fastened on the Tripod, Makes It Possible to Take Stereoscopic Views with the Regular Camera

¶ Recently a musical program, played on a phonograph at the Canadian wireless station at High River, Alta., was heard by a station on Maui Island 100 miles from Honolulu, or about 2,800 miles from the sending station.

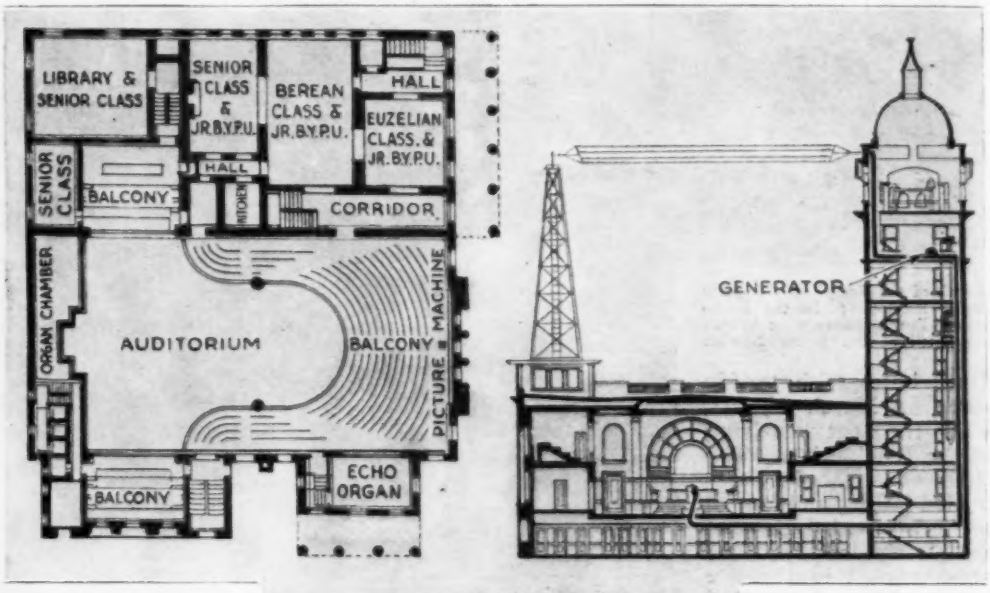
SHREVEPORT CHURCH HAS MANY UNUSUAL FEATURES

By ARCHIE RICHARDSON

A RADIO broadcasting station with a coast-to-coast radius and a 10-story tower are novel features of the First Baptist Church of Shreveport, La., erected at a cost of $500,000, and used for the first time Sunday, April 9. The structure, uniting a main building of four floors and the 10-story tower, contains 51,000 sq. ft. of floor space, and accommodates 7,000 persons.

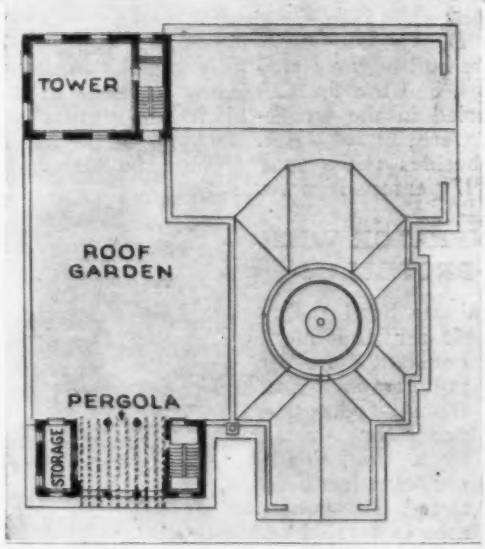
The main auditorium has a seating capacity of 2,500 to 3,000, and is equipped with a four-manual organ, with echo set, and chime connection for special music features. Even the deaf are provided for in this church, for a so-called acousticon has been installed in the pulpit and connected with the pews by concealed wires. The tower, on the ninth floor of which is installed a carillon of 13 bells, and the connecting rooms of the main building provide for a Sunday school of 3,000. A roof garden has accommodations for 1,000, and will be used for regular services, concerts, and social meetings in the summer. There is also a banquet room that seats 500 at two tables, and a nursery in the basement is provided with sand piles and, under supervision, cares for children of mothers who are attending services, or who are occupied during the week. The dining rooms of the church furnish noon lunches to several hundred working girls daily, besides serving banquets several times a week.

Situated almost in the heart of Shreveport's business district, the tower dominates the city's skyline.



Third-Floor Plan of Church Building, Showing Arrangement of Special Rooms for Classes, and Auditorium with a Seating Capacity of 2,500 to 3,000 Persons

Section through the Church Building, Showing Wires Leading from the Pulpit to the Radio Generator on the Eighth Floor of the Tower and Thence to the Antenna

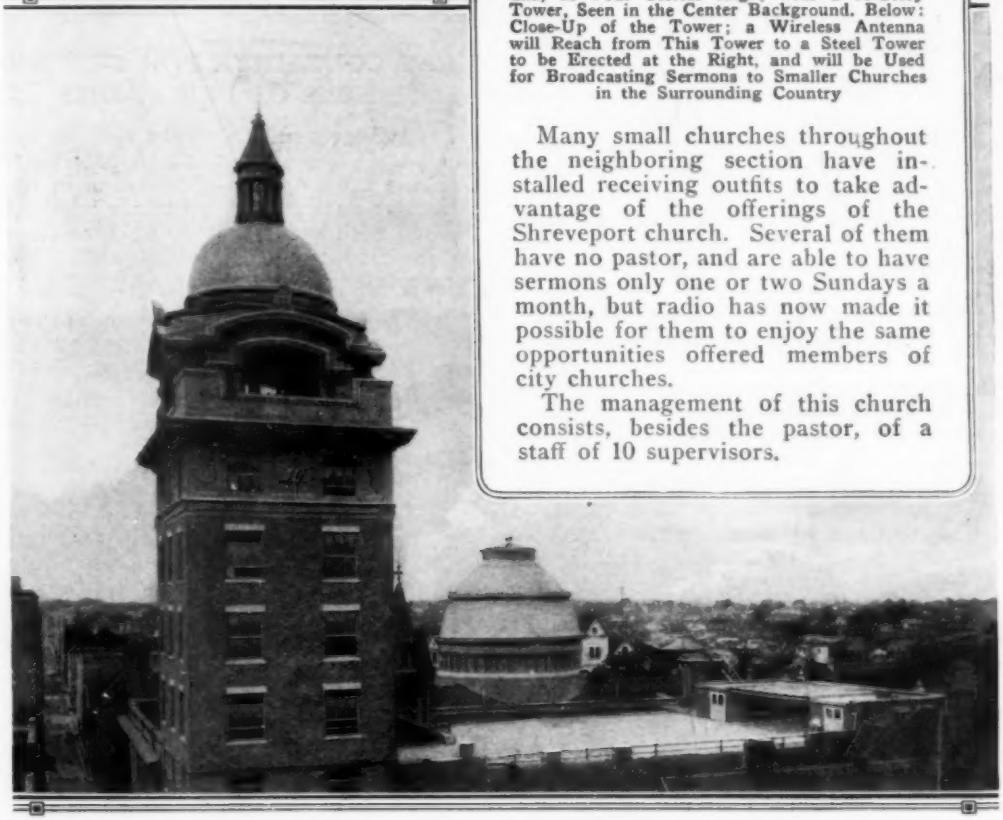


This Roof Garden, with a Seating Capacity of 1,000 Persons, will be Used in Summer for Concerts and Social Meetings

Above: This Church in Shreveport, Louisiana, Is Four Stories High, with a 10-Story Tower, Seen in the Center Background. Below: Close-Up of the Tower; a Wireless Antenna will Reach from This Tower to a Steel Tower to be Erected at the Right, and will be Used for Broadcasting Sermons to Smaller Churches in the Surrounding Country

Many small churches throughout the neighboring section have installed receiving outfits to take advantage of the offerings of the Shreveport church. Several of them have no pastor, and are able to have sermons only one or two Sundays a month, but radio has now made it possible for them to enjoy the same opportunities offered members of city churches.

The management of this church consists, besides the pastor, of a staff of 10 supervisors.



WOODEN LEG FOR ELEPHANT AS ADDED ATTRACTION

An elephant having a wooden leg would be a rare and curious sight, at least so

Wooden Leg Which is Fastened to the "Knee" of the Elephant in Preparation for the Gaze of Curiosity Seekers

thought the proprietor of a small circus, recently, when he had a peg constructed for one of these huge animals. The peg, solidly fashioned of 4-in. oak, has a metal cap at the top for the insertion of the elephant's "knee." With this makeshift limb —only worn during the day—the behemoth hobbles around, much to the wonderment of the spectators, and the resultant free advertising incidentally yields lucrative financial returns to the owner.

VENTILATION OF MACHINERY INCREASES EFFICIENCY

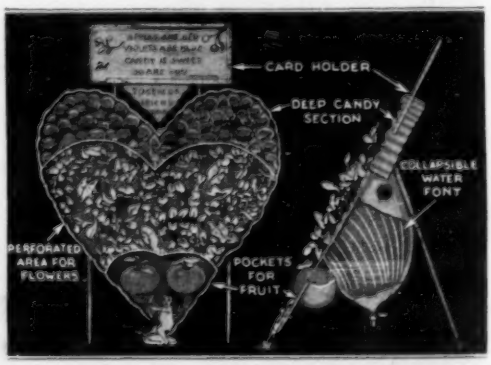
Investigations covering many different kinds of machines, especially electrical machinery, have shown conclusively that machines need constant ventilation to render them more efficient. Rotating machinery, or machines which have a large number of smaller working parts, such as printing machinery, textile, paper, and grinding machinery, and practically all electrical units, need moving air about them to carry away fine dusts and fumes that, sooner or later, raise havoc with the moving parts of the machine. Excess heat and static charges of electricity are practically eliminated by currents of moving air, particularly if the air is properly conditioned, or moistened, before being passed over and about the machine. While lack of ventilation shows scarcely noticeable effects in short periods of observation or tests, in the long run they may become very injurious. Therefore, extensive studies are often made, taking into consideration even such things as the direction of rotation of all moving parts of the machine, with a view of designing and arranging types of blowers that will properly ventilate the machine.

OVERHEATED AIR COMPRESSOR STOPPED BY FUSIBLE PLUG

Fusible plugs are being used in South Africa to protect air compressors, and pipe lines in connection with them, from excessive heat in the air, with accompanying formation of dangerous pressures. When the plug fuses it releases by means of a valve the overheated air from the mains, and at the same time acts on another valve that shuts off the steam supply to the compressor engine. To restart the compressor, a new fusible plug is inserted, and the valves are reseated. Compressed-air systems in South Africa are likely to suffer from overheating on account of the almost constant high atmospheric temperatures.

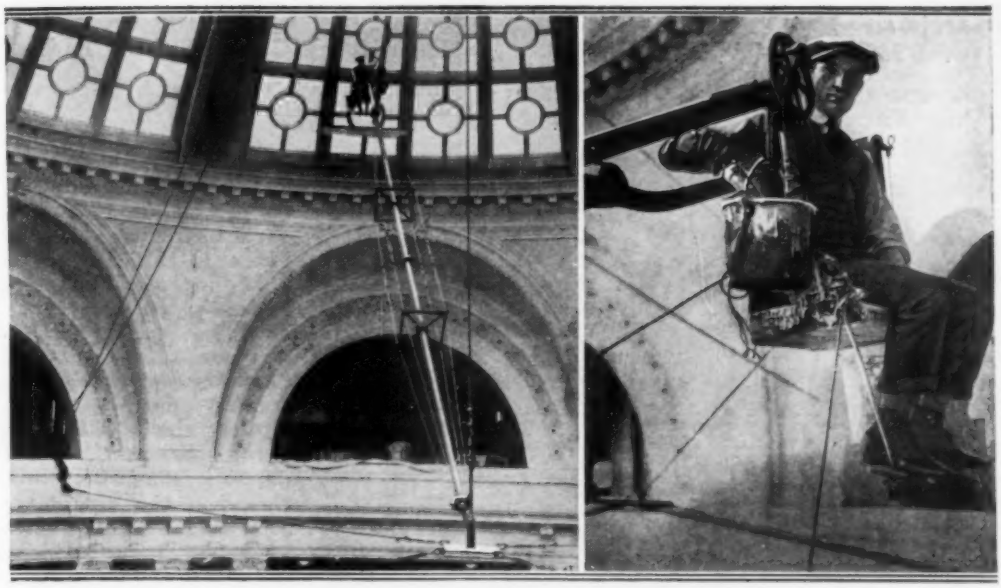
NEAT CONTAINER FOR SENDING TOKENS OF FRIENDSHIP

Instead of sending candy and flowers in separate packages, it is now possible to combine these tokens of affection in one attractive package. A container has been devised with space at the top for candy, an individual flower holder and water compartment in the center, and a division



This Novel Gift Holder Provides Spaces for Candy and Fruit, and a Flower Holder with Water Container Below

for fruit at the bottom. A card at the top, bearing an appropriate sentiment, completes the assembly.



Scaffold for Painting the Large Dome in a San Francisco Department Store: At the Left It is Suspended with Its Boom That can be Swung Around, Raised or Lowered, and Lengthened or Shortened. At the Right Is a Close-Up of the Painter's Seat

CLEVER METHOD OF PAINTING INTERIOR OF LARGE DOME

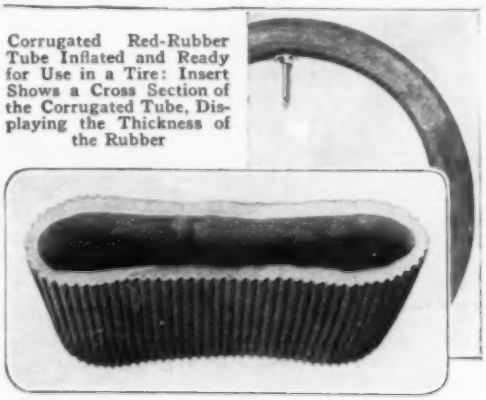
Over the main part of one of San Francisco's biggest department stores is a large dome, and the building superintendent of the store has devised a very ingenious scaffold to facilitate the painting and cleaning of it. Suspended from the center of the peak to about the level of the bottom of the dome is a steel cable, which is rigidly braced by four guy ropes. Pivoted at the bottom of this cable is a long derrick boom, from the end of which is slung a comfortable seat for the painter. This boom can be swung around the dome, raised or lowered, and lengthened or shortened, so that any part of the face of the dome is easily accessible.

TWO LONDON-PARIS AIR-ROUTE PLANES COLLIDE AND FALL

On April 7, two airplanes flying in passenger service between London and Paris, collided in mid-air about 70 miles north of Paris and fell in flames, with a loss of six lives—three passengers, two pilots, and a mechanic. The crash was due primarily to the fog, as the pilots were unable to see each other until too late to avoid collision. The planes were flying at an elevation of about 400 ft. when the crash occurred. This air route has been in operation since 1919, and has been remarkably free from accidents, considering the large number of passengers carried, as this is only the second fatal accident. The other occurred when a plane, in taking off, struck a tree.

CORRUGATED RUBBER TUBES FOR AUTOMOBILE TIRES

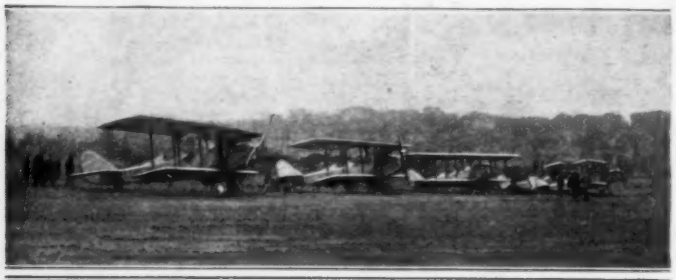
Corrugated red-rubber tubes for automobile tires are the latest addition to the field of motoring, and are the offering of a New York inventor. The purpose of the corrugations is to prevent overheating, sticking, and pinching of the tube within the tire. The innovation is also claimed to aid the vulcanizing process, and to increase the life and elasticity of the rubber.



Corrugated Red-Rubber Tube Inflated and Ready for Use in a Tire: Insert Shows a Cross Section of the Corrugated Tube, Displaying the Thickness of the Rubber

COMMERCIAL FLYING SERVICE STARTS IN CALIFORNIA

A passenger air route has been established between Los Angeles and San Francisco, Calif., and two regular trips will be made each day. Flying time between the two cities will be five hours, with a stop at some central point for luncheon and rest. The single-trip fare is $50, and the distance approximately 400 miles.



Above: Five of the Airplanes That Made the Flight When the Service was Inaugurated. Below: A Close-Up of One of the Planes That Carries Four Passengers and Pilot

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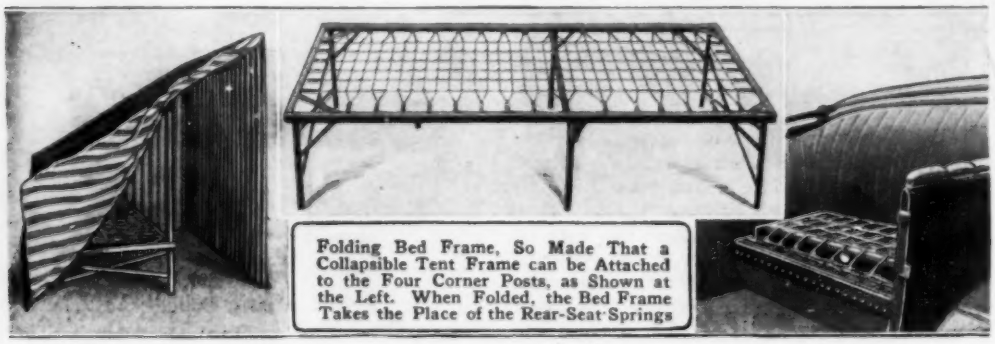
¶A portable radiographic installation has been set up on Flores Island, near Montevideo, Uruguay. It is to replace the submarine telegraph which has hitherto connected the island with the mainland.

USE OF PHONOGRAPH TO MAKE MOVING PICTURES AUDIBLE

The use of the phonograph in connection with moving pictures to make the actor's speech audible has been tried for some time, but never with very satisfactory results. A demonstration was recently given in England of a newly invented apparatus which electrically synchronizes the lip movements of the actors on the screen with the sounds emitted by the phonograph. That part of the problem was solved perfectly, but there still remained the characteristic defects of the phonograph, such as the scraping of the needle, and occasional harshness or indistinctness of the voice. These defects were enhanced by the amplifier horns, which were indispensable in spreading the sound over a large auditorium. If these shortcomings can be remedied, and clearness of enunciation, together with tonal volume, can be obtained, the perfect synchronization of the new apparatus should make audible moving pictures a practical success.

FOLDING BED FOR TOURISTS FITS REAR AUTO SEAT

When touring by automobile, it is essential that all available space should be utilized to the greatest possible advantage. With this in view, a bed has been constructed which, when folded,

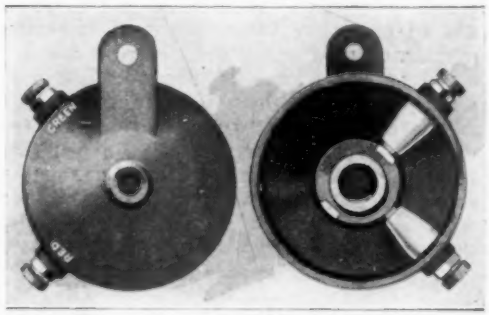


Folding Bed Frame, So Made That a Collapsible Tent Frame can be Attached to the Four Corner Posts, as Shown at the Left. When Folded, the Bed Frame Takes the Place of the Rear-Seat Springs

takes the place of the springs in the rear seat, while the mattress and bedding can be used as a cushion. When the bed frame is extended for sleeping, a folding tent frame can be attached to the four corner posts of the bed, making a serviceable shelter in case of rain. In this way the tourist is assured of a comfortable bed at night, and also makes good use of the space in the rear seat by day.

IMPROVED AUTOMOBILE TIMER HAS ONLY TWO WIRES

On a certain popular light automobile the standard timer in connection with the motor has four wires, two of which, being next to the fan belt, are soon damaged by it. In order to avoid this, a new timer has been brought out that has only two wires on the side that is away from the belt. Another improvement in this new timer is extreme simplicity, there being only one moving part. Furthermore, the contact maker revolves with the camshaft. The revolving and stationary contacts are made of copper, and the



Outside and Inside Views of New Timer with Only Two Wires, to Replace, on a Popular Light Automobile, the Standard Timer Which Has Four Wires, Two of Which are Easily Damaged by the Fan Belt

brush holders are of brass. All these parts are inclosed in a bakelite case that is perfectly nonconducting, and is rust and moisture-proof.

LOUD-SPEAKING REPRODUCER FOR DICTAPHONE RECORDS

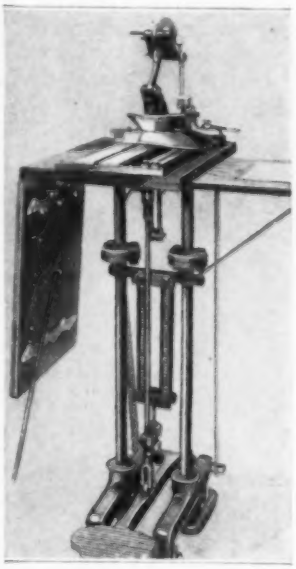
A new dictaphone reproducer has been invented, which is claimed to be far superior to present instruments of its class. In place of the usual sound box, there is a small device containing an armature held between the poles of a magnet, and the grooves in the record impart the vibrations to this armature and set up electric currents, as in the ordinary dynamo. The volume of sound can be altered by shifting a small lever, and increased to such a degree, it is

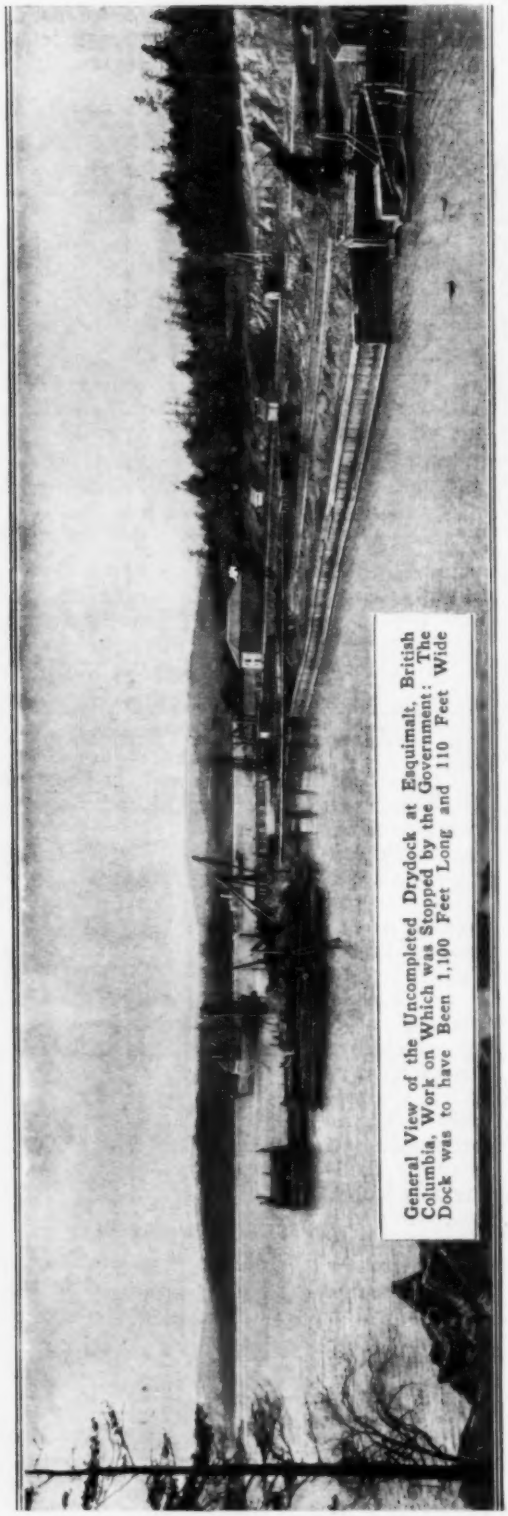
This Dictaphone Reproducer Makes It Possible to Secure a More Accurate Control of the Volume of Sound

claimed, that head receivers are not necessary. This tone-control feature has special appeal where many persons dictate on the same cylinder.

ORDINARY SEAL HAND PRESS MADE INTO FOOT PRESS

Converting ordinary hand presses of any size, such as are used to emboss corporate seals on stock certificates, bonds, or other documents, into a foot press, has been made possible by an eastern inventor. With his machine, this is accomplished without drilling any holes, removing the dies, or in any way altering the hand presses which are quickly inserted, or taken from the outfit to be replaced with a different seal. The apparatus is of rugged and simple construction and requires but little more than one square foot of floor space.





General View of the Uncompleted Drydock at Esquimalt, British Columbia, Work on Which was Stopped by the Government: The Dock was to have Been 1,100 Feet Long and 110 Feet Wide

WORK ON CANADIAN DRYDOCK ORDERED ABANDONED

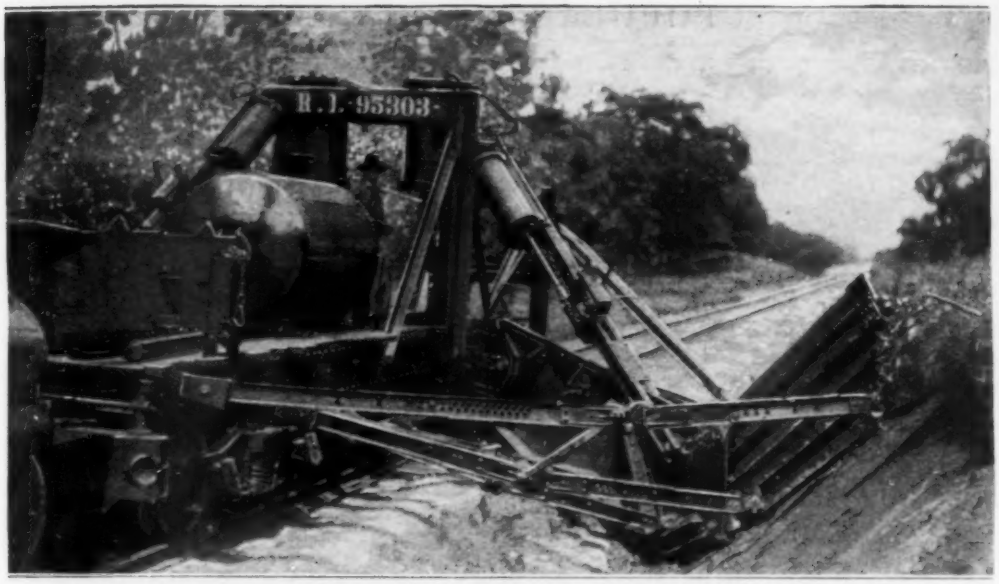
It is not often that a work of the magnitude of the drydock which was being built at Esquimalt, B. C., by the Canadian government, is abandoned in an incomplete condition. Work had been in progress on this contract for over a year and more than $1,125,000 had been spent, when peremptory notice was received from the authorities by the contractors, ordering immediate cessation of work. Although rumors had been afloat for some time that a temporary shut-down might be ordered, pending an investigation by the new government as to the advisability and necessity of this work, the order to quit came as a complete surprise to all parties concerned, couched as it was in such terms as to leave the inference that abandonment was intended.

In the 12 months since construction commenced, 160,000 cu. yd. of rock were excavated, and over 100,000 cu. yd. of material dredged from the approaches to the dock site. Several large timber cribs, intended for portions of the permanent work, were also constructed and in process of receiving their filling of concrete, preparatory to being sunk into position.

As to the cause of the abandonment order, nothing definite is known, although it is thought that the outcome of the disarmament conference at Washington, together with the Japanese treaty arrangements, probably have a good deal to do with it. Esquimalt has for many years been the most important British naval station on the Pacific coast.

TREES GROW FROM STONE BAGS USED AS FLOOD PROTECTION

In protecting the embankment of a railroad in Chile that was in danger of being washed away by flooded streams, wire bags filled with cobblestones and small bowlders were used extensively. In placing the stones in the heavy, galvanized-wire bags, many willow sticks were forced in among the meshes of the wire. The bags were placed end to end along the river's edge for several miles. Some time later it was observed that the willow sticks had taken root among the rocks and were growing rapidly. Accumulating sediment from the river aided the growth until finally a most desirable hedge of young willow trees still further aided in keeping the waters of the river from encroaching on the roadbed.



Wing-Type Ditcher at Work on a Railroad: The Wing or Scraper Attached to the Heavy Car, Which is Moved by a Locomotive on the Track, is Adjusted to Give the Desired Section to the Ditch at the Side of the Roadbed. The Wing Cuts the Soil and Shoves It Ahead

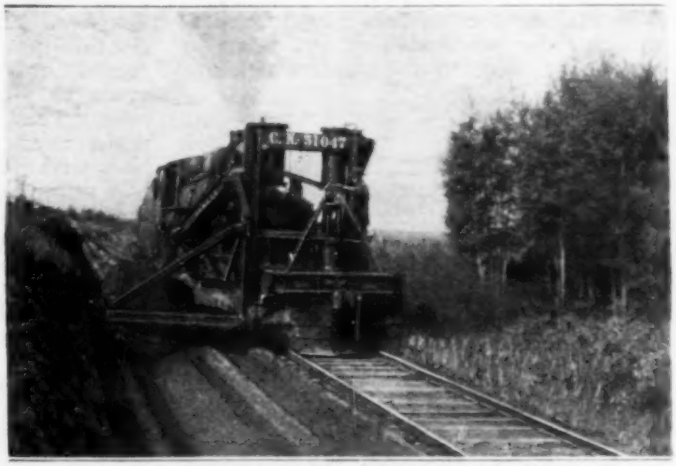
DITCHING MACHINE DOES WORK OF MANY MEN

IN the great work of extending and maintaining America's railway systems, the ditching machine plays a prominent part. Recent improvements have made the present-day ditching machine a wonder worker in changing the appearance of a railroad's right of way. When it is considered that a modern machine can do as much work in a day as a gang of 200 section hands, it is apparent that such a machine must represent real construction economy.

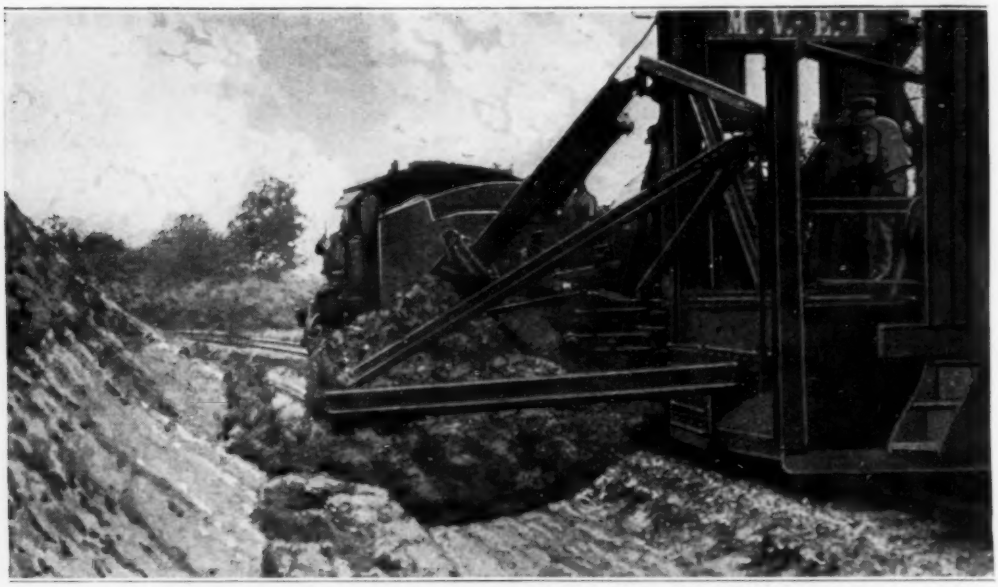
The wing type of railway ditcher has been developed from the old-type spreader car. A heavy car is equipped with a scraper blade, or wing, that is shaped to conform to the standard section of the ditch and roadbed shoulder. This blade cuts the soil and shoves it ahead until it can be thrown clear of the roadbed. A larger type of machine has wings on both sides and can thus clean the two ditches at the same time.

In operating the machine, it is often necessary to make three or four runs through the cut, depending on the nature of the soil. On the last run, a steel template is used on the bottom of the wing to finish the roadbed shoulder, ditch, and side slope to standard form. When working under average conditions, a machine should move about 400 cu. yd. of material in a day and finish almost a mile of ditch.

A heavy locomotive is required for this work. It is run at a speed of four to eight miles per hour, varying according to the quantity and nature of the material to be handled and the condition of the track. When the second wing is used, much back haul is eliminated. With both



Last Run of Ditcher being Made with Steel Template on the Bottom of the Wing to Finish the Roadbed Shoulder, the Ditch, and the Side Slope to Standard Form



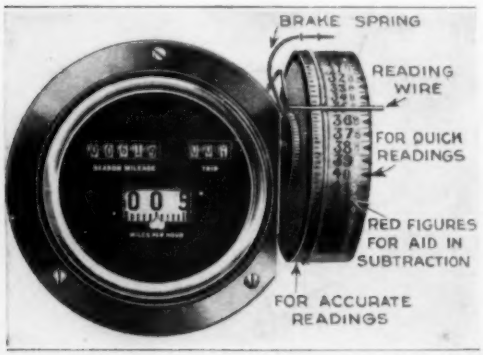
Another View of the Wing-Type Ditcher Making the First Cut in the Process of Forming the Ditch and Roadbed Shoulder: The Steel Frame Supports the Air Cylinder That Operates the Wing, Which Is 15 Feet Long and 5 Feet Deep

wings in operation, the outfit is so balanced that a higher speed is possible. To operate this outfit, only one or two men are needed in addition to the regular crew.

The car is fitted with cast-steel cutting shoes that clear the track of obstructing material. An upright steel cross frame supports the vertical air cylinders used for operating the main wings. The wing measures 15 ft. in length and 5 ft. in depth. For transportation, the wings are folded compactly against the car.

AUTO SPEEDOMETER CHANGED TO MAKE SOIL SURVEYS

In making the traverse surveys necessary for the production of soil maps to a scale of 1 in. to the mile, which are being made everywhere by the U. S. Bureau of Soils, measurements were taken in the past by the use of the common odometer attached to the front wheel of a buggy. Now that the buggy has been replaced by the automobile, the odometer has been replaced by the speedometer. As this instrument in its standard form records only .1 mile, changes had to be made to make readings possible to .01 mile. The speed and season-mileage registers are left unchanged. In connection with the trip-mileage register, the trip setter that extends from the side of the speedometer head is changed so that it is permanently connected to the trip-mileage gears. On the shaft of the setter is then screwed, and locked with a nut, a large dial with a scale on its circumference graduated to suit the required readings

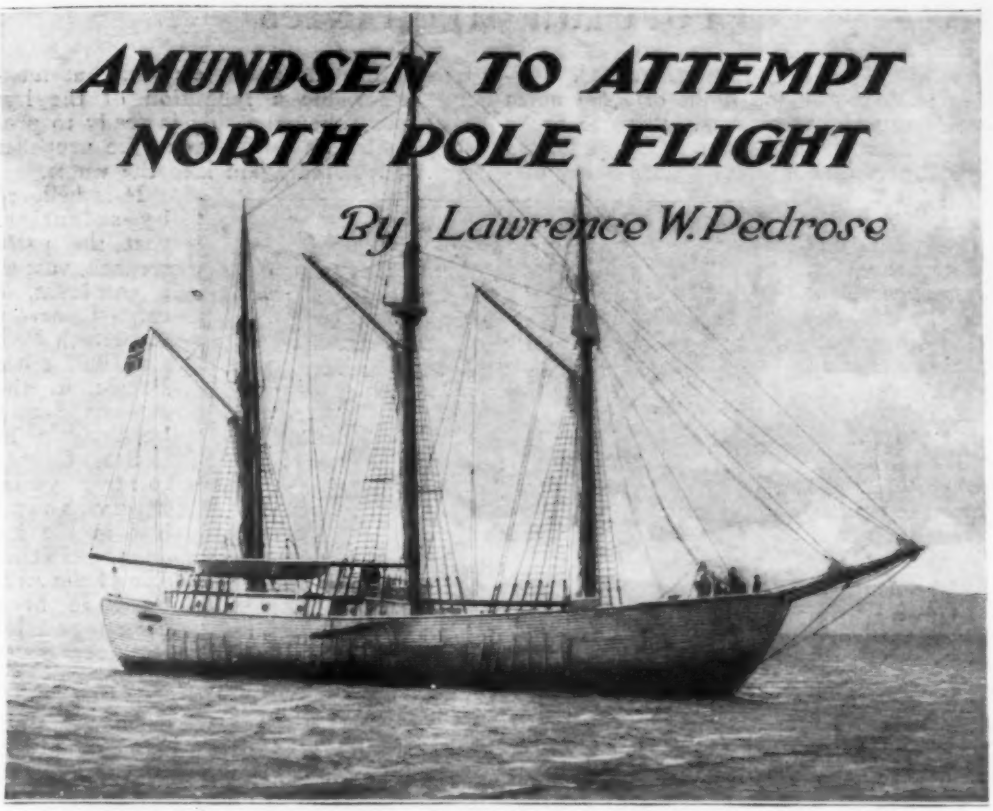


Standard Automobile Speedometer Changed to Make Possible Measurements in Hundredths of a Mile, Registered on the Large Dial Attached to the Trip Setter of the Speedometer

¶It has been found that copper salts added to casein glues greatly increase their resistance to moisture and also make them more durable when exposed to the action of molds and fungi. Glues containing little lime are specially improved by the addition of copper, which does not shorten the life, or period of workability, of the glue, as much as an addition of more lime would.

AMUNDSEN TO ATTEMPT NORTH POLE FLIGHT

By Lawrence W. Pedrose



The Three-Masted Schooner "Maud," Leaving Puget Sound on Its Second Trip to the Arctic Regions, in Command of Captain Roald Amundsen and with a Picked Crew: The Intention Is to Enter the Ice Floes before Winter, and after being Frozen In, to Drift with Them across the North Pole

OUTFITTED and provisioned for a seven-year cruise, the power schooner "Maud" left Puget Sound early this month with Capt. Roald Amundsen, discoverer of the South Pole and conqueror of the Northwest Passage, and a crew of picked men, who will make a second attempt to drift across the polar basin in the vicinity of the North Pole. The "Maud" carries with it two airplanes, one of which is to be utilized, if necessary, for the final dash to the pole and return.

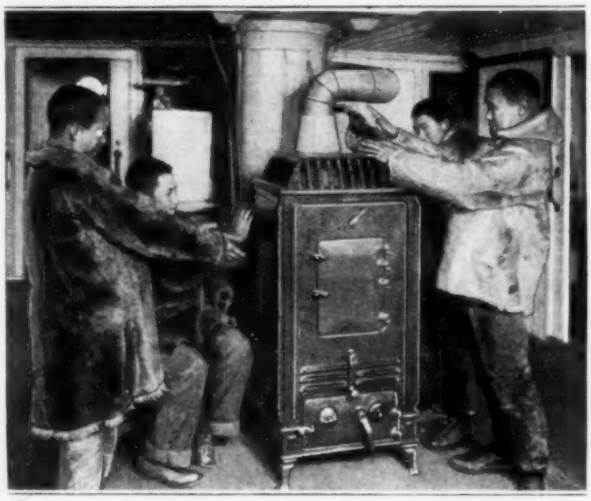
Captain Amundsen is a Norwegian scientist and explorer. He is 50 years old. He reached the South Pole in 1910-11. Financed by the government and King Haakon VII of Norway, Captain Amundsen left Christiania in July, 1918, and entered the Arctic through Bering Strait in the fall of the same year, intending to freeze in with the icepack and drift across the polar sea. However, the vagrant ice floes moved to the west, then eastward instead of to the north, and the "Maud" lost its propeller near Cape Serge, Siberia, in October, 1921. Short of supplies, Captain Amundsen returned to Nome, Alaska, and from there came to the United States.

Captain Roald Amundsen, Who Expects to Take the "Maud" to the North Pole

At Seattle the famous exploring ship of Commodore Peary, the "Roosevelt," was chartered to succor the "Maud." The "Roosevelt" reached the "Maud" and towed it to St. Lawrence Island, where there was no ice to impede its progress, and it sailed under its own canvas to Seattle, 2,500 miles southward. As the "Maud" is flat-bottomed, without a keel, the feat is considered without parallel in Pacific marine annals.

Returning to Norway, Captain Amundsen perfected plans to continue his search for the North Pole. There he procured the services of a Norwegian-army flight officer to pilot the airplane, an all-steel JL-6 plane, obtained in New York,

which held the endurance record, having made a nonstop flight of 2,400 miles a few months previously. Because of its bulk, the machine was to be flown across the American continent before being dismantled and stowed away in the "Maud." Unfortunately, it was wrecked on the trip, but this did not alter Amundsen's plans, and the large plane carried will be able to take the whole crew out of the Arctic, should the ship be crushed in the ice.



Comfortable Living Quarters on the "Maud," and Four of the Siberian Eskimo Sailors Warming Their Hands at One of the Heating Stoves with Which the Ship is Equipped

Another modern invention, with which the ship will be equipped, is a long-range radiophone outfit, and it is not beyond the bounds of possibility that this Arctic voyage, far from being the lonesome venture of earlier explorers, will be relieved by frequent exchange of news or other information with the centers of civilization.

Part of the Crew of the "Maud," with Doctor H. V. Sverdrup and Captain Oskar Wisting in the Center, Scientist and Navigator Respectively, Who have Accompanied Captain Amundsen on His Various Explorations

The "Maud" has been fitted with a device for lifting its propeller when it is frozen into the polar icepack, thus making impossible a repetition of the last mishap. When the ship is ready to proceed under its own power, the propeller will be lowered again into the water.

It is believed by scientists that the polar icepack, vast as a continent, is carried across the North Pole from the Pacific to the Atlantic and back again in cycles of three to five years. Many ships lost in the ice on the Pacific side of the Arctic have been disgorged by the floes, years later, on the Atlantic side.

The "Maud" will enter the Arctic via Nome, in time to nose into the eternal ice floes when the winter freeze begins. Once in the grip of the floes, the explorers will have nothing to do but drift, make observations, and gather magnetic and meteorological data. New lands may be discovered and claimed, and it is possible rich mineral deposits will be found. These will accrue to the kingdom of Norway, under whose flag the "Maud" sails.

The personnel of the party will comprise eleven men: Captain Amundsen, commander; Capt. Oskar Wisting, personal friend of the explorer and his companion on the South Pole trip; Dr. H. V. Sverdrup, eminent Norwegian scientist; the pilot of the plane, and a crew of seven Siberian Eskimo sailors, who have remained with the "Maud" since the last unsuccessful attempt to reach the pole.

Although provisions enough to last seven years are carried, Captain Amundsen believes his ship will

emerge in the Atlantic Ocean within three to five years. It is expected the ship will reach a point nearest the pole in the early spring of 1924. With the "Maud" as a base for operations, the big plane will then be brought into use for the final dash to the North Pole, while the other plane, a Curtiss Oriole type, christened the "Kristina" before it was delivered to the explorer at Curtiss Field, on April 6, will be used for scouting purposes and other incidental service. It is equipped with an electric self-starter, can stay in the air seven hours, and like its mother ship will fly the Norwegian colors.

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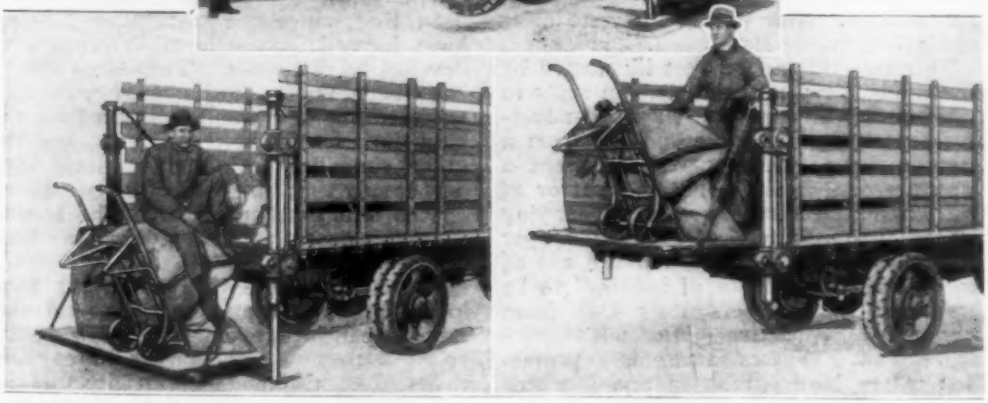
Christening of the "Kristina," at the Curtiss Field: In the Foreground, Left to Right, Are the Pilot, Lieutenant Omdahl; the Sponsor, Miss Lily Raynor, and the Explorer Himself

ELEVATING END GATE ATTACHED TO MOTOR TRUCK

The appearance on the market of a new elevating end gate for motor trucks should come as welcome news, not only to the driver who has to load the truck, but also to the merchant who is anxious to speed up deliveries and reduce costs. The elevator is attached to the rear of the truck and the elevating gears are driven from the engine shaft, a simple shifting of a convenient lever raising or lowering the end gate. Should the truck be stuck in the mud, the elevating screws may be used as jacks to lift the truck until skids can be placed under the wheels or the depressions filled in.



This Elevating End Gate Takes Much of the Labor Out of Truck Loading. The Hand Truck is Run onto the Gate When in the Low Position, and by Shifting a Lever, Gears on the Engine Shaft are Thrown In and the Gate and Load Raised

WISCONSIN'S NOVEL METHOD OF ATTRACTING SETTLERS

Wisconsin's method of adding to the population and wealth of the state is distinguished by absolute originality, and what is better, by unparalleled success. Like all states, not to mention Canada, where immigration is desired, Wisconsin uses printed pamphlets describing the attractive features of the state, but it uses these only as a secondary feature—the

Reduced Reproduction of a Large Chart, Showing by Dots the Locations of the 5,280 Families Who have Settled in Upper Wisconsin Since the War, as a Result of the Immigration Bureau's Work

primary feature of its method of attracting new residents, and of retaining them after settlement, being an entirely personal appeal, an appeal from man to man, from the director of immigration directly to the prospective settler, and a supervision of his interests after his arrival in the state.

This method can be best illustrated by describing a typical example. In reply to a bureau of immigration classified advertisement, there came an inquiry from a man in Iowa. In reply to this went a long personal letter from the director of the bureau, interpreting an accompanying pamphlet on "Farm Making in Upper Wisconsin," and pointing out the use of an inclosed "certificate of inquiry" to be presented to any person or firm from whom the prospective settler might purchase land. This certificate is a protection to the land purchaser, and it warns the land salesman that the Wisconsin Bureau of Immigration intends to keep in touch with the purchaser during the whole transaction. Thus is the immigrant in a large measure protected from falling into the hands of unscrupulous land agents, and should he nevertheless do so, he could appeal to the bureau to have his wrongs righted.

The first inquiry from the man in Iowa was followed rapidly by another, asking for a soil map of a particular county. This was sent to him, accompanied by a pamphlet on the subject, and another personal letter from the director of immigration, fully explaining the soil map and describing the characteristics of that county.

After that came several "follow-ups," all personal letters from the director with the object of maintaining the interest of the man in Iowa, and offering service by men who are experts in their respective lines of work. These letters make the prospective settler better able to avoid mistakes in purchasing and selecting land. Every branch of the Wisconsin farming industry is described, from land clearing to potato growing, with special pamphlets on each subject.

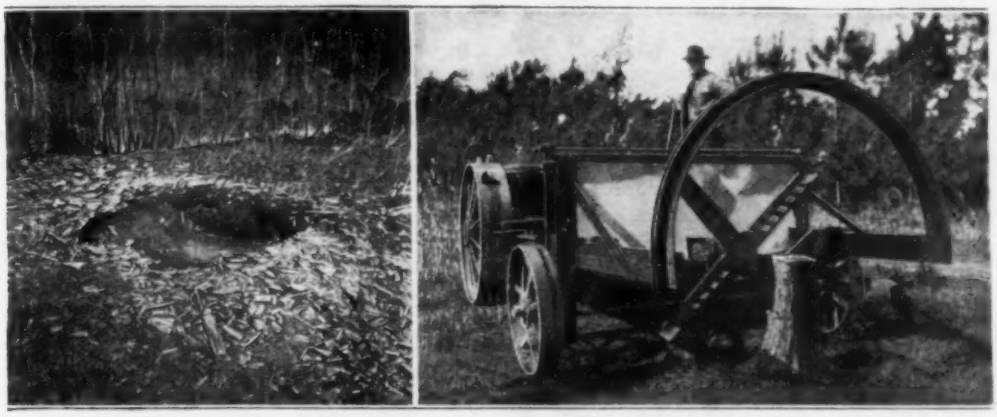
Then came the final punch, a short note with an intimate touch—so intimate that it even mentioned how irresistibly it made the director's stenographer smile at the very idea that the man in Iowa wouldn't realize how splendidly he could make good if he would come to Wisconsin. It was explained that every member of the department felt the same way about it as the stenographer, and the man in Iowa was asked kindly to "just write a note on the back of this sheet and return it to us in the inclosed stamped envelope."

The reply came within a week—not from Iowa, but from Wisconsin. That last note had converted the prospective into an actual settler.

The result of this kind of work has been that, since the war, 5,280 families have located in northern Wisconsin to develop farm homes. Two large charts have been made, one covered with dots representing new families located on the land during the last three years, and the other showing, with similar dots, each new family that has been directly assisted by the immigration bureau. The second chart has nearly as many dots as the first.

¶Corrosion of the iron apparatus used in the process of manufacturing sal ammoniac, can be prevented by allowing the solution to flow over pieces of calcium carbonate. Complete neutrality of the solution is said to be obtained by this method, which has recently been patented in Great Britain.

MACHINE LEAVES ONLY CHIPS IN PLACE OF STUMPS

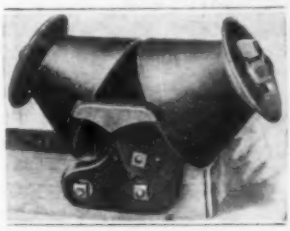


When the Tractor Wheels Force This Machine Ahead, the Rapidly Revolving Cutter Arms Reduce the Stump to Chips in a Short Time, and Leave Only a Moderately Large Hole in the Ground, as Shown at the Left

The problem of removing stumps has been attacked from many angles, including burning, dynamiting, and the use of many forms of stump pullers. Now another machine has made its appearance which is a radical departure from the usual designs. At first sight it looks like a wind wagon or a machine for testing airplane propellers, but in place of the propeller is a rapidly revolving four-blade cutter, which, when forced ahead by the tractor, reduces a stump to chips in a very short time. The engine furnishes all necessary power for traction and cutting.

NEW FORM OF GUIDE FOR USE WITH LONG BELTS

In driving farm machinery, such as a thresher or sheller, from the drive pulley of a tractor, it is often difficult to place the two pulleys exactly in line. In order to prevent the belt from slipping off the pulley, a guide has been devised with flanged, conical rollers, which hold the belt in place but do not fray the edges as a stationary guide would.



ANCIENT MOUNTAIN HIGHWAY BECOMES MODERN RAILWAY

The most important of the old Norwegian highways crosses the Dovre, the most famous of all Norway's mountains, and for more than a thousand years was the main route between north and south. Now, in place of this mountain highway is a first-class state railway, which, although only 100 miles long, it required 10 years to build. The fact that only 10 miles a year could be built will be understood when it is learned that 23 tunnels had to be constructed with a total length of about five miles, and altogether 87 bridges had to be built. Moreover, the railway had to cross a 3,335-ft. summit.

SUPPORT FOR NONSWIMMERS MADE IN ANIMAL FORM

On the order of the inner tube of a tire, much used by nonswimmers to make floating and deep-water bathing safer and more enjoyable, a buoyant contrivance of a more elaborate character has been devised, that has the appearance of an exaggerated duck, or other amphibious animal. This improved float, or buoy, is not blown up like the tire tube, but is made of waterproof material filled with a very light packing. It surrounds the body of the bather, like the tire tube, but is much larger and has a duck's or other animal's head in front.

RADIO OUTFIT COMBINED WITH AIRMAN'S OXYGEN HELMET

The use of the oxygen helmet has become a necessity when attempting record altitude flights because of the rarefied air

This Is the Type of Suit Which must be Worn When Flying at Extremely High Altitudes. The New Oxygen Helmet will Also Contain a Wireless Sending and Receiving Set

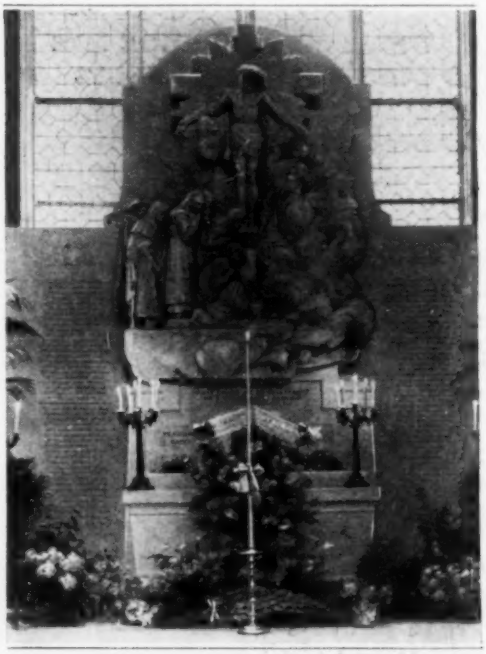
at the upper levels. The army air service has now designed an oxygen helmet in combination with a sending and receiving set for wireless-telephone messages, so that the airman may keep in communication with the ground station, no matter at what altitude he may be flying. The radio generator will also furnish current for the electric-heating elements contained in the airman's protective suit.

NEW TYPE OF LEATHER BELT TO PREVENT SLIPPING

A type of leather belt that will not slip on a pulley has been invented in France. It is of oak-tanned leather and has riveted on the under, or pulley, side strips of chrome leather. The manufactured sizes are from 1 in. to 16 in. wide, with the chrome strips 3/16 in. wide by 5/32 in. thick, and a 3/16-in. space between strips. The rivet attachment consists of a single line of brass rivets, 2 in. apart, in each chrome strip. It is claimed that the combination of oak-tanned and chrome leather gives the ideal of tensile strength in the former and efficient adhesion in the latter. In the ordinary belt the presence of air between pulley and belt is a cause of slipping; in the new form of belt any such air is squeezed into the spaces between the strips. Comparative tests with an ordinary belt and one of the new type, each 3 in. wide by 1/4 in. thick, showed the coefficient of friction of the latter to be greater than that of the older style.

MONUMENT UNVEILED IN PARIS TO VICTIMS OF BOMBARDMENT

It will be remembered that on Good Friday, four years ago, the church of St. Gervais, in Paris, was struck by a shell from the famous German long-range gun, located 75 miles away. A large congregation was in the midst of its devotions, and 91 persons were killed and 150 injured. On the fourth anniversary of this sad event the archbishop of Paris unveiled a monument in the restored church, erected to the memory of the victims.



Monument Erected in the Church of St. Gervais, Paris, to the Memory of the Victims of the German Bombardment, Good Friday, 1918

¶ Designed to meet the peculiarities of the roads and local conditions, the first Japanese automobile has a wheelbase of 84 in., and a weight of 850 pounds.

TEST AMPHIBIOUS MOTOR CAR ON RIVER RHONE

Paddles, Forming Part of the Four Wheels, Furnish Means for Propelling the Car in the Water

The Amphibious Car is Here Approaching the Bank of the Stream after Traveling on the Water

Two Float Tanks Supply Buoyancy for the Car When in the Water, and the Wheels are Drawn Up by a Special Arrangement So the Paddles will Be at the Proper Depth

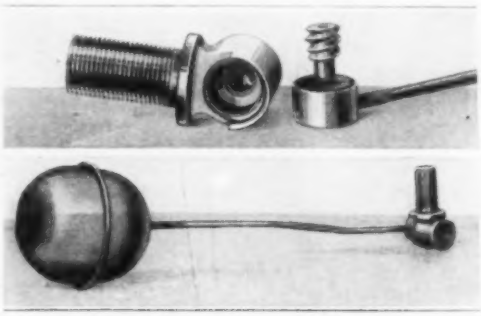
Another new motor car which will travel equally well on land or water, the product of an inventor of Lyons, France, has proved successful in preliminary trials which have been held. It was first tested on a canal in the neighborhood of the great silk center, and with 10 passengers on board developed a speed of 7½ miles per hour against the current. Before this preliminary trial it was driven along the road from the inventor's garage, and after the trip made its way home with perfect ease.

A more exacting test has now been carried out on the swift-flowing river Rhône. Entering the water on the quay side, by way of one of the inclined planes used as landing stages for small craft, the car was easily steered in face of a rapid current, and thus, traveling now on the road, now on the river, about 15 miles were covered during the tests.

Indeed, so successful was this second test that the inventor announced that he intended shortly to take his amphibious car to Calais by road and there try to cross the Channel to Dover. Propulsion in water is obtained by paddles, forming part of the four wheels, which are raised by a special mechanism when the car is floated. In this way the paddles are at the right level. This test car is fitted with a 14-hp. motor. Two float tanks support it when in the water.

NEW AUTOMATIC BALL VALVE OF EXTREME SIMPLICITY

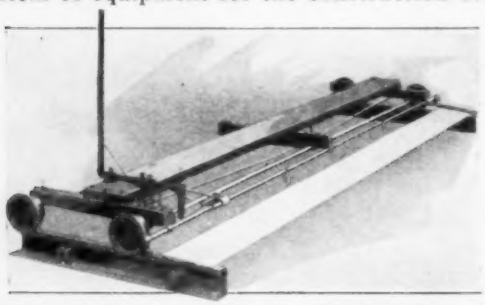
Consisting of only two parts, a noiseless automatic ball valve, the invention of a veteran journeyman plumber, is the essence of simplicity. The valve is in the form of a spindle, threaded into a socket so that when the floating ball in connection with the spindle is in the required position, the valve has moved onto a valve seat in the socket, automatically closing it. The thread has a large pitch, and the least movement of the ball reopens the valve. It is made of brass, and has little to get out of order.



Simple Automatic Ball Valve Seen Assembled Below, and Disassembled Above, on an Enlarged Scale, Showing the Only Two Parts of Which It Consists—a Spindle and Socket

FLOAT BRIDGE LATEST AID FOR ROAD BUILDING

Supplementing the work of the "finishing machine," a float bridge—the latest item of equipment for the construction of



Combined Float and Bridge for Finishing Concrete Roads: The Smoothing Belt is Operated by the Lever Fastened to the Bridge, Which is Mounted on Wheels

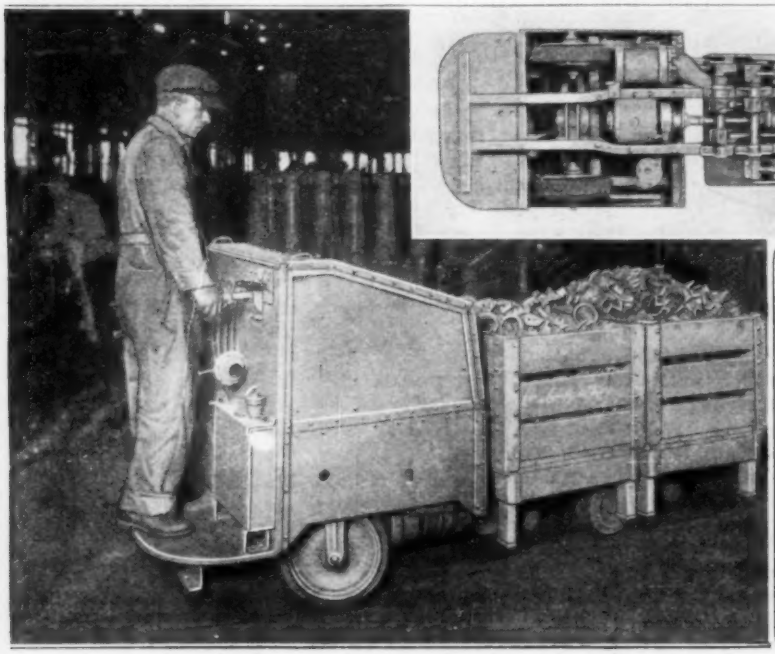
concrete roads—has recently been developed by a Cleveland company. The essentials of the apparatus are a combined belt float and substantial bridge extending across the pavement, all of which can be easily handled by one man. A lever moves the smoothing belt back and forth over the soft surface of the work and at the same time automatically advances the machine with each stroke. It is claimed that after the concrete has been struck off, tamped, and surfaced, the use of the float bridge prevents the appearance of "hair cracks" in the finished product.

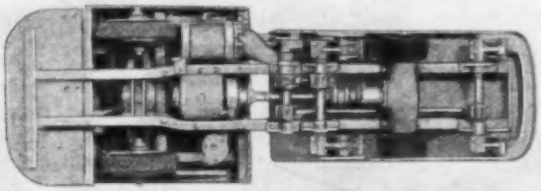
EVENTS OF AMERICAN HISTORY TO BE SHOWN IN FILMS

That the study of American history may be made something besides the mere drudgery of memorizing names and dates, is presaged by the announcement that many of the more important events are to be made the subjects for motion-picture films. More than one hundred reels are to be made under the auspices of Yale University, and every effort will be made to have all details authentic.

ELEVATING-PLATFORM TRUCK HAS GASOLINE MOTOR

Elevating a platform, 26 in. wide by 54 in. long, with a load of 4,000 lb., from a minimum of 11 in. to a maximum of 16 in. from the floor in eight seconds, is possible with a new gasoline-driven truck. The lifting mechanism is operated by hydraulic pressure derived from a 15-hp. 4-cyl. tractor engine, which is mounted at the rear in a closed compartment containing the transmission, governor, vacuum tank, radiator, etc. The machine has a forward and reverse speed of six miles per hour, will climb a 10-per-cent grade fully loaded, and has a brake-lever pedal so arranged that the removal of foot pressure automatically causes it to stop. High-grade roller and ball bearings are used in the running mechanism.





Elevating-Platform Truck being Used in a Machine Shop for the Purpose of Transporting Heavy Bins Containing Miscellaneous Unfinished Parts from One Department to Another: The Control Levers, Gasoline Tank, and Siren Horn can be Plainly Seen in Front of the Operator. The Insert Gives a Bottom View of the Elevating-Platform Truck and Shows the Lifting Mechanism Which is Actuated by Hydraulic Pressure Derived from the Engine

The ROMANCE of the RECALLED MAIL

By Grace Orb

DID you know that there is a department in Uncle Sam's postal service whose business it is to "snatch back" letters for the sender—letters which, if delivered, would entail all kinds of undesirable consequences, every possible phase of human tragedy or comedy? On the quick action and accuracy of the employes in this department ofttimes hinges not only hundreds of thousands of dollars, but even human life itself. Thirty thousand such cases were handled by the Chicago office during last year.

A man, holding a high position with an eastern corporation was going from New York to San Francisco. He stopped off in Chicago in order that he might get some special-delivery mail which was to meet him there. This mail was coming from the West, and on its receipt at this point hinged a $2,000,000 contract and the decision as to whether he should go straight on to San Francisco or return at once to New York; should he fail to receive it, not only the contract would be seriously jeopardized, but he would be left in a quandary as to his next move. On his arrival he went to the hotel and asked for his mail, and was told by the clerk, "Yes, we did have some mail for you, but we have just sent it back to the post office. You know our instruction was to hold mail for you 24 hours and then forward to Kansas City. Sorry; it has not been gone half an hour." By some unlucky chance his mail had arrived 24 hours ahead of him. And he dared not miss those letters! He went at once to the postmaster, and with the assistance of the hotel authorities, explained his dilemma, proved his identity and ownership of the mail, and it was rescued for him just as it was about to be placed in a bag bound for Kansas City. The man was saved and all was well; but the margin of safety was exceedingly narrow.

"John had probably (in a fit of anger or jealousy) written a nasty letter to Miss Blank . . . a little later he came to and wanted to get the letter back."

Another instance: A young man (well groomed, but evidently much disturbed in mind) came into this department of the service one day; gave his name as John S., and wanted to get back a letter addressed to Miss Mary Blank; said he had put a "wrong inclosure" in this letter, and it was extremely important that it be corrected. He gave proof of his ownership of the letter and it was given back to him on the reason given by him—"wrong inclosure." But, being wise in human lore, the employe knew that John had probably (in a fit of anger or jealousy) written a nasty letter to Miss Blank (perhaps breaking his engagement to her) and mailed the letter immediately; a little later he came to, regretted the letter, and wanted to get it back.

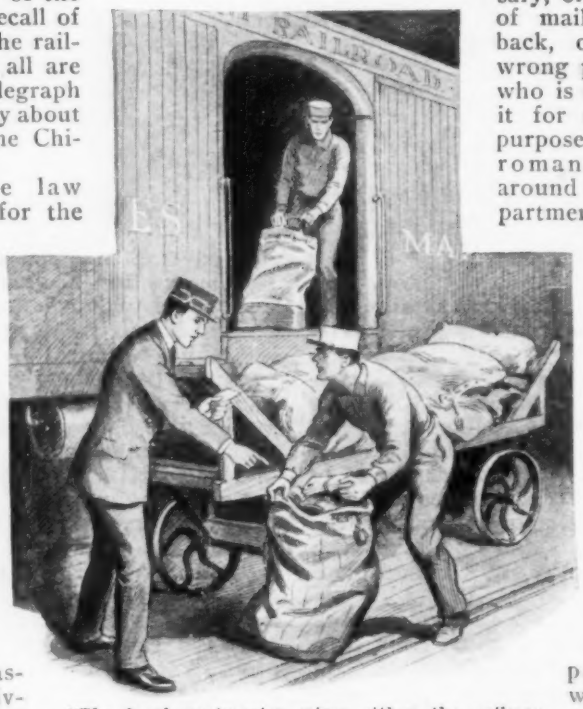
Many, many times in the course of a year this kind of situation arises, and the postal service turns omnipotent and holds up the consequences of the letter written on the impulse of the moment.

A large manufacturer was sending out price lists to his outlying representatives; some 20,000 of these letters had just been placed in bags and sent to the down-town post office. A wire came in that market prices had gone up. If those letters should be delivered, he would be the loser by thousands of dollars. There was quick action, the regular forms were resorted to, and with strenuous effort the letters were intercepted before they left the city office.

Of the many reasons given for the recall of mail, that of "wrong inclosure" predominates; and these words are a convenient symbol for the letter written in

haste, or for the changes necessitated by the fluctuations of the market. Practically 90 per cent of the requests for the recall of mail come from the railroads, and nearly all are local recalls. Telegraph recalls average only about one per day in the Chicago office.

However, the law makes provision for the recall of mail anywhere (with the exception of mail sent to Great Britain or its colonies, to which reference will be made later), whether it be before it leaves the post office of the sender, en route on train or ship, or in a foreign country. Application is made by the sender to the local postmaster for a recall, giving the reason for such, and he wires either the railway clerk or the postmaster of the addressee (at the expense of the sender, who also deposits a sufficient sum of money to cover return telegram or cablegram, as the case may be). The letter is returned, the sender calls for it, and leaves a receipt which is kept on file. A foreign recall is handled through the second assistant postmaster-general.



"The local postmaster wires either the railway clerk or the postmaster of the addressee (at the expense of the sender, who also deposits a sufficient sum of money to cover return telegram or cablegram, as the case may be)."

This course of procedure applies generally except to Great Britain and its colonies. Here the law considers the letter which is once posted to be from that time on the property of the addressee. The United States takes the other view; namely, that a letter is the property of the sender until it has been placed in the possession of the addressee. Hence the whole procedure rests upon the sender's establishing his ownership of the mail to be recalled. While this law proves a mighty boon to many an anxious individual, it is easily evident that the exercise of the greatest possible care is necessary, or the wrong piece of mail may be given back, or given to the wrong person, or to one who is desirous of using it for some illegitimate purpose. Nevertheless the romance clustering around this particular department of the postal service is exceedingly interesting and offers almost as varied an appeal as does the human equation itself.

"The letter is returned, the sender calls for it, and leaves a receipt which is kept on file."

GIGANTIC TURBINE PLANT DESIGNED

A German professor has prepared a design of a super-power station in which the units will be of 160,000 kva. each, or almost three times as large as the largest turbo-generators that have so far been constructed. The turbines are designed as double-flow machines, with steam admission in the center and exhaust at both ends. The weight of each unit will be about 600 tons, of which the rotor represents nearly 222 tons. Each station will have six units, one being held in reserve. One hundred boilers of 10,750-sq.-ft. heating surface each, will be required, and the cooling water necessary could be supplied only by a large river. The station would consume 50,000 tons of coal per week, which would be handled in trainloads from the mines and dumped into bunkers at the station, to be fed into the boilers by bucket conveyors. It would be transported from storage by overhead railroads. Five of these super-power stations would be able to supply the total power demand of Germany.

RUNAWAY TRUCK DEMOLISHES ARMY BARRACKS

WHILE delivering coal with a truck in the Panama Canal Zone, the driver attempted to back the machine against a coal shed, which was located on the lower side of a road leading up a hill, and lost control of the vehicle. Breaking through the light guard rail at the edge of the highway, the heavy truck plunged down the incline and crashed into a large building being used as an army barracks. The impact was so great that the building collapsed, as shown in the accompanying photograph, burying beneath the débris a soldier, who was the sole occupant and who received but slight injuries from the unusual accident.

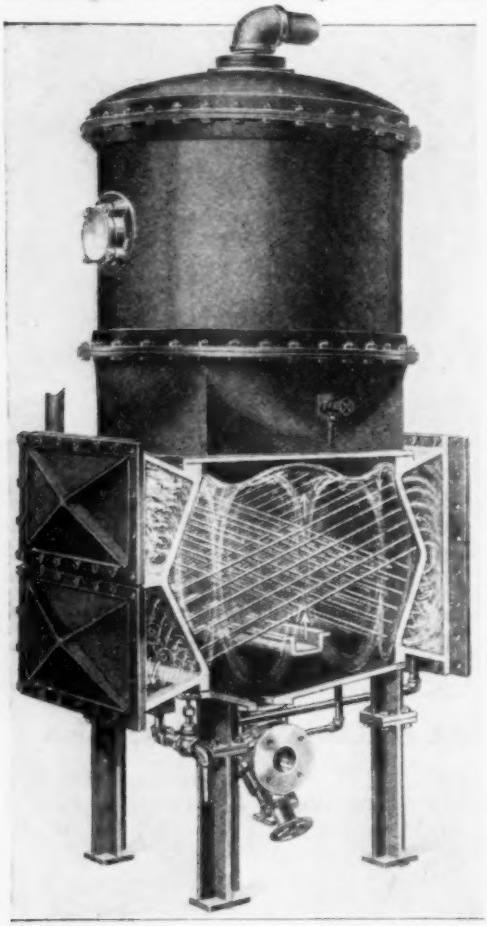
WHITE CEMENT BLOCKS FOR CROSSING MARKERS

A new method of outlining the limits of street crossings, which does away with the necessity of painting the lines on the pavement once or twice a year, has been adopted by the city of Portland, Ore. White cement blocks, 6 in. in cross sections and 2 ft. long, are set into the pavement with their edges flush with it. They are slightly crowned on the top side so that they project about 1 in. above the surface at their centers. Each street intersection requires 56 of the blocks to outline the four crossing limits, there being seven of them placed on each side of each crossing. Hydraulic cement, mixed with a solution rich in celluloid, is used in making the blocks. The latter ingredient has the effect of producing a very hard, tough, durable, glasslike finish which, it is thought, will withstand heavy traffic.

Hydraulic-Cement Blocks are Used to Mark Street Crossings in Portland, Oregon. Being Exceptionally Smooth, Hard, and Tough, They are Expected to Last Several Years, Thus Eliminating the Yearly Painting Job

EVAPORATOR TUBES ARRANGED IN DIAGONAL LINES

A new type of evaporator has been designed which appears to combine the advantages of the older styles in which



In This Evaporator the Steam Passes Downward through One Bank of Tubes and Returns through the Other Bank. The Liquid being Evaporated is Introduced in the Shallow Pan beneath the Tubes

the tubes were arranged either vertically or horizontally. In this new evaporator the tubes are placed in banks along diagonal lines, and the construction is such that the steam passes down through one set of tubes and returns through the other set. By this method of placement it is possible to use tubes of smaller diameter, which are claimed to be more efficient for the transfer of heat. Also, the water condensed from the steam flows by gravity in the same direction that the steam is traveling. The liquid to be evaporated is introduced in the center below the two banks of tubes.

PROCESS FOR ELIMINATING DISEASES IN COTTON

Boll rot and other fungus diseases of cotton may be eliminated by a process which is the result of many experiments, extending over a period of two years, made at the University of South Carolina. The cotton seed is first dried and heated to a temperature of about 212°F. It is then subjected to a treatment by sulphuric acid, which removes the lint and kills all fungi, particularly the boll rot. It was found during the experiments that a very large proportion of the seed treated was perfectly sterilized by the sulphuric acid alone, without previous heating. Seed treated in this manner was found to sprout much more rapidly than untreated seed.

ABANDONED CHURCH BUILDING UTILIZED AS A GARAGE

An abandoned church building in Washington, D. C., has been converted into one of the most commodious and serviceable garages in the city. The old wooden floor was replaced by one of concrete, and part of the steeple was torn down, the remainder serving as support for a large water tank. The garage accommodates the numerous milk wagons con-

Between the Limbs of the Trees can be Seen the Front of a New Garage in an Old Abandoned Church Building. Part of the Old Steeple is Replaced by a New Water Tank

nected with the largest dairy in Washington. The front exterior of the building was repaired and finished so that it looked like a new stone building.

Screened-In Body Which is Built on an Automobile Chassis and Which is Used to Transport the Hounds to the Starting Point of the Hunt: The Fox Horns and Other Necessities of the Hunt are Seen on the Top of the Conveyance

"HOUND WAGON" TRANSPORTS CANINES TO THE CHASE

Yelping and eager for the sport, fox hounds belonging to a southern estate are hauled to the chase in a specially designed "hound wagon." This consists of a double-decked, screened-in body built on the chassis of a small automobile, on top of which are carried the fox horns and other necessities of the hunt.

¶It is announced that Tufts College, Medford, Mass., is to commence giving a series of lectures by radiophone under the auspices of the faculty. The lectures will be broadcast twice a week.

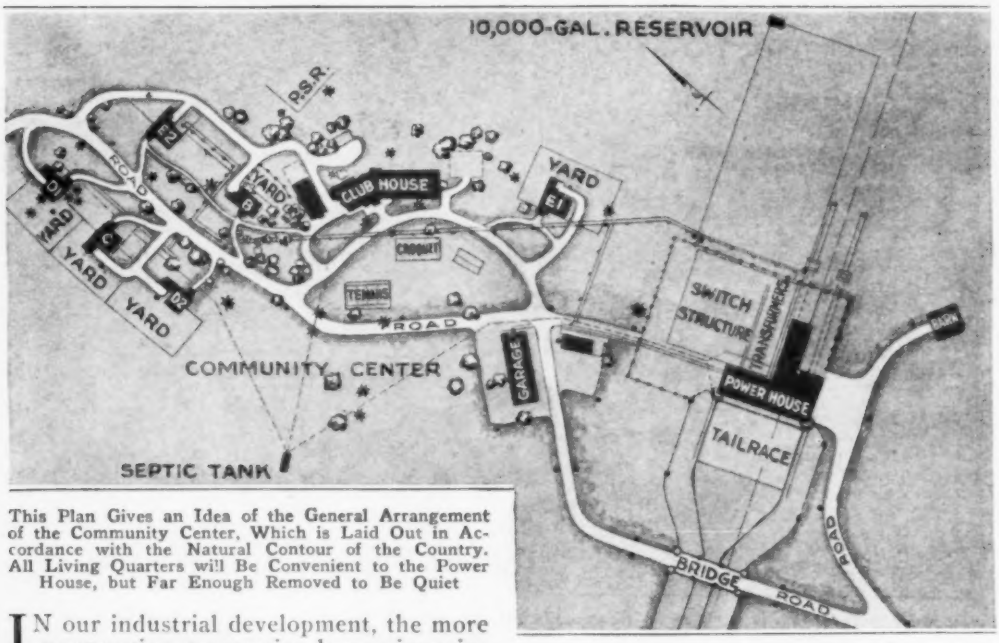
RESIDENTIAL PART OF CITY DAMAGED BY OIL GUSHER

Before the discovery of oil, Signal Hill was one of the most beautiful residential sections of Long Beach, Calif., and many of the finest homes were located there. Now, however, it looks like an oil field which has strayed into town by mistake. Recently one of the oil companies operating there brought in a well which proved to be a gusher, and the entire section was drenched with a spray of black oil which ruined trees and gardens and caused untold damage to houses and furnishings. The oil spray was carried in some cases a distance of three miles from the oil well.

Left: This Gives Some Idea of the Appearance of the Trees after being Drenched with the Spray of Black Oil from the Gushing Oil Well. Right: Before the Discovery of Oil, This Was One of the Most Beautiful Residences in Long Beach, but It Is Now the Office of One of the Oil Companies

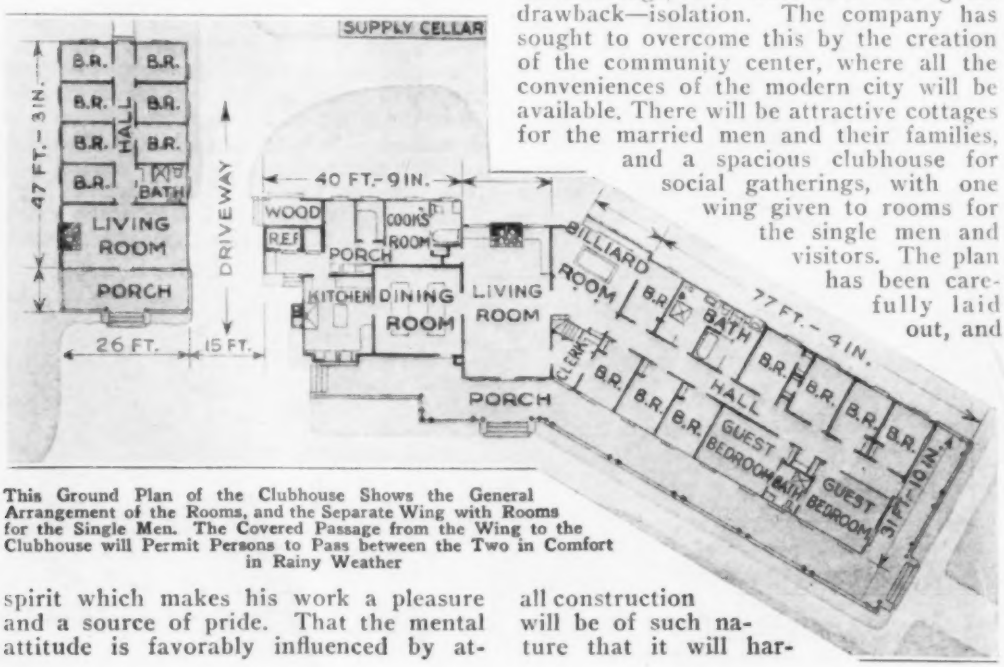
COMMUNITY CENTER AT ISOLATED POWER PLANT

By CHARLES W. GEIGER



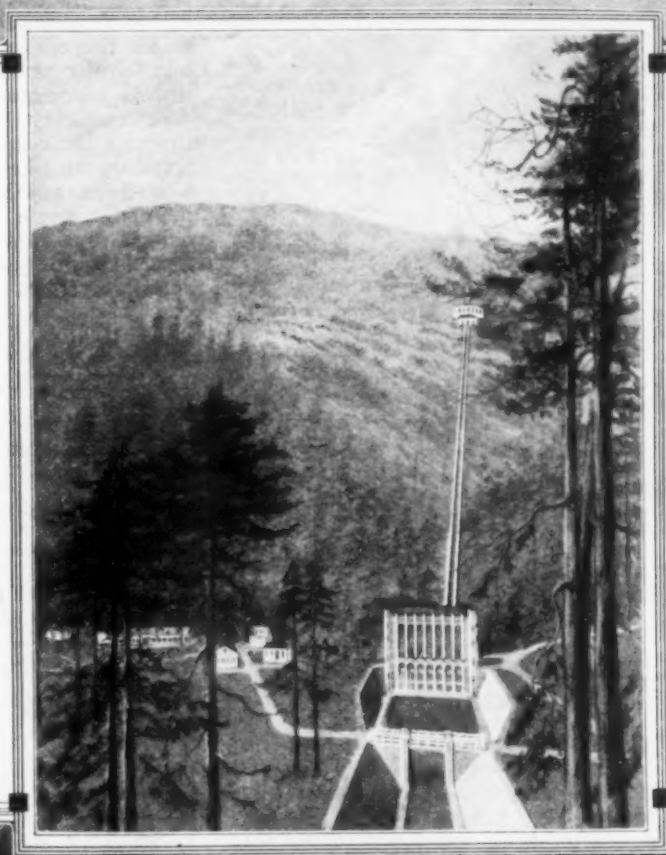
This Plan Gives an Idea of the General Arrangement of the Community Center, Which is Laid Out in Accordance with the Natural Contour of the Country. All Living Quarters will Be Convenient to the Power House, but Far Enough Removed to Be Quiet

IN our industrial development, the more progressive companies have given increased attention to the physical and mental welfare of their workers, not entirely from altruistic motives, but because they realized that the mental attitude of the individual had a direct bearing on the quality of his service. A cheerful, contented worker brings to his task a spirit which makes his work a pleasure and a source of pride. That the mental attitude is favorably influenced by attractive surroundings and comfortable accommodations has been realized by one of the power companies on the Pacific coast, and has found expression in the community-center development at one of its power plants. The station is located in the high mountains among beautiful surroundings, but will have one great drawback—isolation. The company has sought to overcome this by the creation of the community center, where all the conveniences of the modern city will be available. There will be attractive cottages for the married men and their families, and a spacious clubhouse for social gatherings, with one wing given to rooms for the single men and visitors. The plan has been carefully laid out, and all construction will be of such nature that it will har-



This Ground Plan of the Clubhouse Shows the General Arrangement of the Rooms, and the Separate Wing with Rooms for the Single Men. The Covered Passage from the Wing to the Clubhouse will Permit Persons to Pass between the Two in Comfort in Rainy Weather

This View of Three of the Cottages Exemplifies the Care That has been Used in Designing Them So That They should Have an Individual Appearance. Right: The Power House with Its Beautiful Surroundings



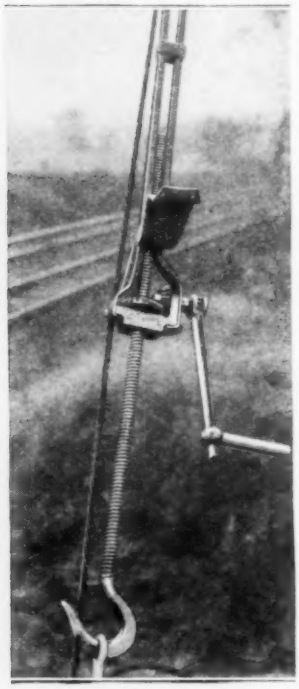
monize with the surroundings. Native rock will be used for the foundations, and different combinations of rustic exterior coverings will be used, so that each home will have an individuality of its own.

¶ In order to impress the points being brought out in a safety campaign, the Bureau of Mines is making arrangements with a number of producing oil companies in California to make moving-picture films of the petroleum industry.

This View of the Clubhouse Gives an Idea of the Way in Which It will Blend with the Surroundings. The Foundation will Be of Native Rock, and the Exterior of Rustic Design. The Separate Wing will Contain Rooms for Single Men

SLACK PULLER TO REPLACE BLOCK AND TACKLE

For pulling the slack out of guy wires, or for any similar work, to much better advantage than with the customary block and tackle, a special slack puller has recently been placed on the market. Instead of requiring the work of several men, as is often necessary with the block and tackle, this puller can always be operated by one man. The pulling power is obtained by a pair of bevel gears that operate a bronze nut in connection with a long threaded rod, at the end of which is a strong drop-forged hook. The gearing is driven with a ratchet crank, which gives one man plenty of power for any ordinary wires.



RUBBER GRIP FOR PENCILS PREVENTS SLIPPING

Adaptable to various sizes of pencils or penholders, a soft-rubber sleeve has been invented to eliminate the constant slipping down of the fingers when writing. The sleeve, or tube, has longitudinal slits cut in it, which permit the regulation of the tube to any desired finger position. This is accomplished by twisting the solid ends of the appliance and pushing them toward one another, after being placed on the pencil or pen.

Left: Rubber Grip for Pencils, Showing How the Ends are Twisted and Pushed Together. Right: Rubber Grip before being Twisted

OIL PRODUCTION IS LESSENED BY DELAY IN DRILLING

Recent investigations by the Bureau of Mines have shown that a delay in drilling into an oil formation after it has been opened may cause a loss up to 50 per cent in the ultimate amount of oil produced from a well. When a well penetrates the oil formation, the oil is forced out by the pressure of the gas included in and associated with the oil. This gas pressure may cause the oil to move through the deep layers from surrounding territory and be forced or pumped out of a well on adjoining property. This explains in some cases why the first well drilled in a new field may have a much larger production of oil than wells drilled at a later time.

COMBINE HOME SAVINGS BANK WITH NEAT DESK WATCH

There is no doubt that the home savings banks have been the means of inducing people to save their money, but, unfortunately, in some cases the little banks have been put away and forgotten. Now, however, one type of these metal banks has been combined with a watch to form an attractive desk clock, and this is an assurance that the bank will be kept where it will be always ready to receive any spare change. The bank has a capacity of $12 to $14 in the various coins, in addition to which there is a slot for the insertion of paper money.

¶ At a recent wireless-receiving contest the championship was won by a young man from Chile, and a new speed record was established when he received 49½ words per minute sent in continental code by wireless.

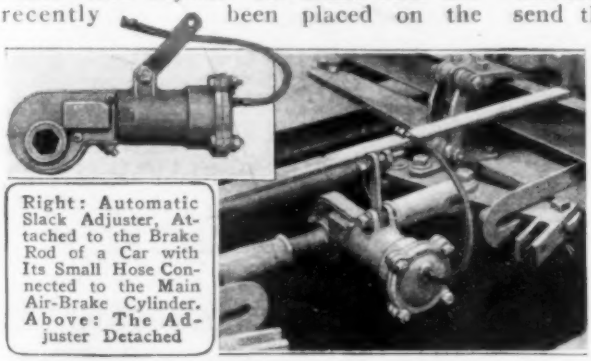
ONLY MOHAMMEDAN MOSQUE IN WESTERN WORLD

For the first time in history a Mohammedan mosque has been erected in the western hemisphere. Although there are many thousands of Moslems in America, most of whom observe their religious customs as far as possible, they have never had until recently any mosque or house of worship in the new world. Now, however, a building has been completed in Highland Park, a suburb of Detroit, which is typically Turkish in design, having two minarets, one on each front corner and a small tower of similar design in the center of the roof, these three towers all bearing the star and crescent. The auditorium is so arranged that, in accordance with the ordinances of their faith, the worshipers will face Mecca when they perform their daily prayers.

Mohammedan Mosque in Highland Park, near Detroit, Showing the Towers Adorned with the Star and Crescent: Although There Are Thousands of Moslems in America, This Is the First Mosque Ever Built in the Western Hemisphere

AUTOMATIC SLACK ADJUSTER FOR BRAKE RODS

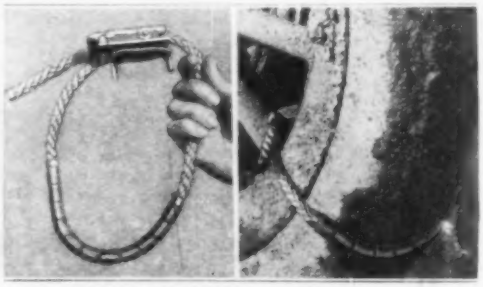
For use on railroad cars, an automatic slack adjuster for brake rods has recently been placed on the market. It automatically adjusts the rods in connection with the brakes, so as to compensate for wear on the brake shoes and on the wheels of the car, for which, without this device, the only remedy is to send the car to the repair shop. The slack adjuster is attached to the brake rod of the car truck, and has a small hose connection to the main air-brake cylinder through a port 3 in. from the cylinder's end. When shoe wear causes the piston in this cylinder to travel beyond this port, compressed air is admitted automatically to the small cylinder of the slack adjuster, where it moves forward a pawl that engages a ratchet on the brake rod in such a manner that, when it is returned by the action of a spring in connection with it, the proper adjustment is made to cause the shoe to act again.



Right: Automatic Slack Adjuster, Attached to the Brake Rod of a Car with Its Small Hose Connected to the Main Air-Brake Cylinder. Above: The Adjuster Detached

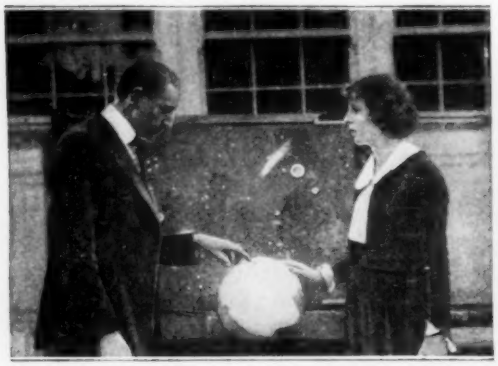
TIRE ROPES REPLACE CHAINS ON MOTOR-CAR WHEELS

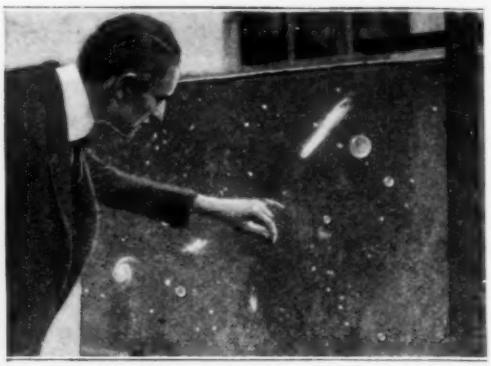
Armored tire ropes, as substitutes for the commonly seen chains, have been produced by an Ohio man, for use on any motor car when it is difficult to obtain good traction. The covering of armor extends over the width of the tire, and a wedge clip is employed to keep the rope from shifting. When the armor becomes worn on one side, it is an easy matter to twist the rope so that another part of the armor will be exposed to wear.



At the Left is Seen the Armored Tire Rope, Showing the Wedge Clip That Keeps It from Shifting. The Manner of Attaching the Rope to the Wheel and Tire is Shown at the Right

MOVING PICTURES TO ILLUSTRATE EINSTEIN THEORY

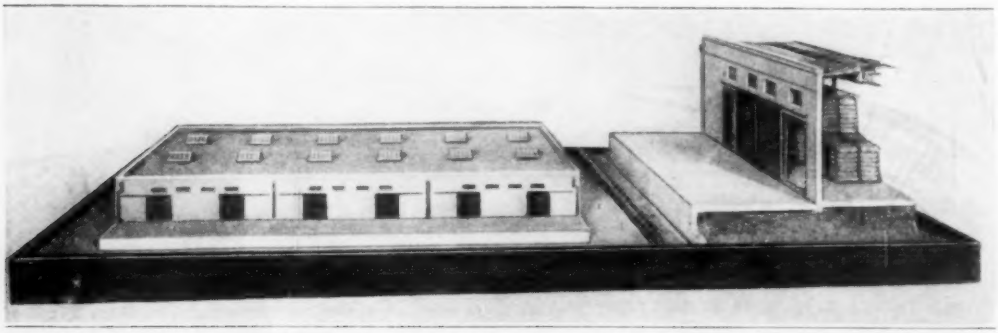




AN ATTEMPT is being made to visualize by means of the movies Professor Einstein's much-discussed theory of relativity. Already many feet of film have been made in this attempt to picture the intricate principles involved in the theory in such a manner that anybody can understand them. In doing this, all the tricks of the movie camera—such as double exposures, lap dissolves, matting out, high and low speeds — have been resorted to. Demonstrations of this kind in connection with the astral universe will be given in an interesting manner by the use of the objects shown in the accompanying pictures, in which the small ball in the upper left-hand picture is a miniature reproduction of the earth. This will be used in combination with the reproduction of the nocturnal heavens shown in the upper right-hand picture. In this the stars and planets are made of colored glass, and can be manipulated as desired. With these objects, the process of making a film is shown in the lower picture. Another part of the film will be devoted to the application of the principles to occurrences of everyday life, so that they will convey concrete ideas to minds that are old or young, simple or complex. This will be done by means of pictures of adventures of an extraordinary nature that might happen to human beings by a strict application of these principles.

MODELS SHOW BEST TYPES OF COTTON WAREHOUSES

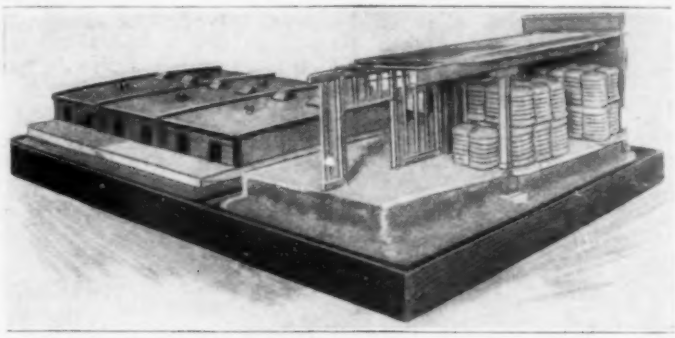
Model fireproof cotton warehouses that pay for themselves in a few years out of savings in insurance rates alone, have recently been designed by the Department of Agriculture. These warehouses combine utility with every known fire-protective device. They range from one-story buildings with wooden walls that can be



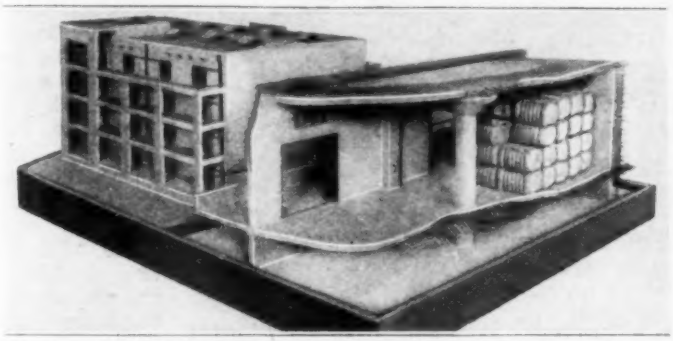
This Model of a One-Story Cotton Warehouse of Reinforced Concrete Exemplifies the Best Features in Fireproof Construction. The Section at the Right Shows Automatic Fire Doors and Concrete Loading Platform

knocked down in case of fire, to four-story reinforced-concrete buildings that are practically indestructible.

One model is a one-story three-section brick structure with concrete foundation and loading platforms. Continuous fire-brick walls, 18 in. thick, separate the sections, and extend 18 in. above the roof to prevent the spread of fire from one compartment to another. Additional sections can be added as the business may require. The roof is graveled, and spark-proof. There are automatic sprinkler systems throughout. Double doors at front and back provide continuous passageways for trucking through the building, and light is admitted through skylights, and through windows over the doors.



This Model Shows the Proper Construction When Wood is Used, the Warehouse being Built in Sections, with Walls That can be Knocked Down in Case of Fire, to Aid the Firemen in Reaching the Flames

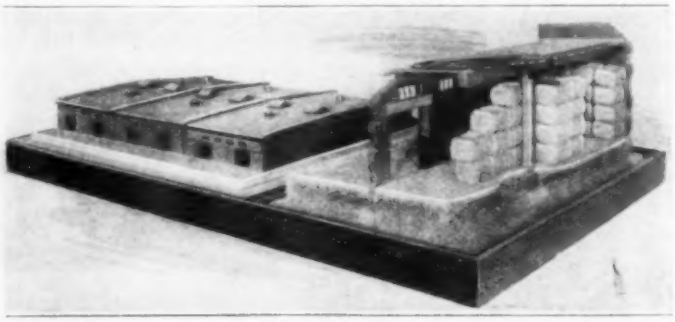


This Is a Model of a Four-Story Cotton Warehouse of Reinforced Concrete and is Equipped with Fire Doors between Sections, Which Close Automatically When a Certain Fixed Temperature is Reached

A reinforced-concrete building in four stories is the most improved type of cotton warehouse known. Spread of fire in the building is prevented by automatic doors which close when the heat reaches 160°F. These doors are controlled by chains with one or two links of soft metal that melts at this temperature. Concrete platforms are provided on each floor for trucking and sorting the bales, a chain elevator being used to raise the bales to the various platforms. Hooks on the chain catch the axle of the truck carrying the cotton, and the bale is automatically disengaged at the proper floor. To lower the cotton, a circular or straight chute is provided. One-story buildings of this type can also be constructed.

Of the 3,000 cotton warehouses in the United States less than 300 are properly constructed to secure the minimum fire-insurance rate, which is 10 cents per $100 of value per annum. The majority of warehouses are improperly constructed as regards fire hazard and pay fire-insurance rates of 50 cents to $3 per $100 of value. Applying these rates to a 3,000-bale capacity warehouse, the saving in premiums on cotton stored in a one-story fireproof building would pay for the structure within five years.

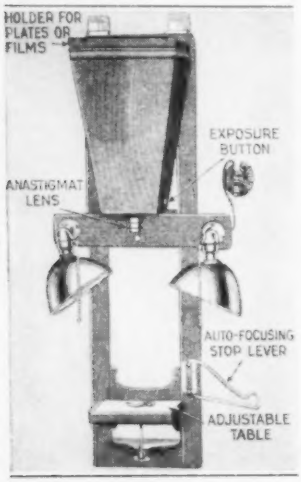
¶ Recent statistics show that one-tenth of the lead produced in the United States is used in the telephone industry.



This Model Shows the Proper Construction for a One-Story Warehouse When Brick is Used. It is Built in Sections, with 18-Inch Firewalls between Them, Which Extend 18 Inches above the Roof

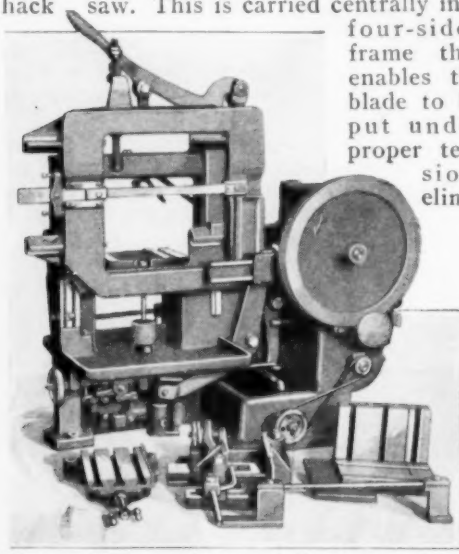
EXACT-SIZE PICTURES MADE WITH JEWELERS' CAMERA

Jewelers will appreciate the introduction of a camera that will photograph any article up to 5 by 7 in., yielding a reproduction which is exact to size and the finest detail. The appliance, which hangs on the wall by hinges, is 40 in. high, 10 in. wide, and 7¾ in. deep, and has an adjustable table on which objects to be photographed are placed and automatically focused by means of a lever at one side of the framework, thus enabling any person to operate the camera.



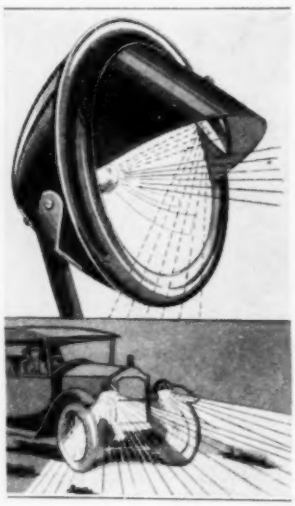
COMPLICATED SHAPER WORK DONE WITH SHAPING SAW

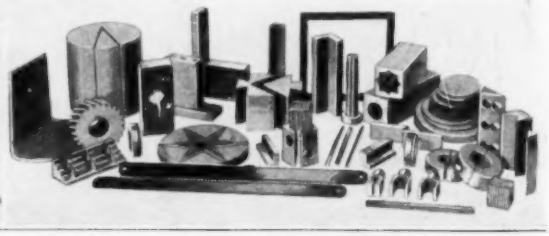
Work similar to that done on a shaper or a milling machine, is now being done with a machine tool that does all its cutting with a saw blade like that used in a hack saw. This is carried centrally in a four-sided frame that enables the blade to be put under proper tension, eliminating all vibration and chatter. The blade is mechanically lifted from the work on the noncutting stroke with a uniform lift on every stroke. There is a uniform feed pressure through the entire cut, and this is regulated automatically by the resistance in the material being cut. The speed can be regulated to suit all classes of material. The machine has various fixtures for angle-cutting operations, and for cross-feeding. It is driven with an individual motor. The outstanding advantages of the machine are the great saving of stock in many jobs, as compared with similar work done on a shaper, and a corresponding saving of time.



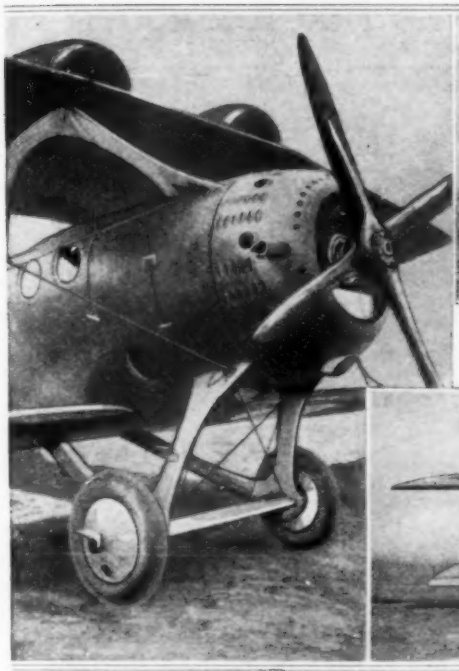
CAR-HEADLIGHT IMPROVEMENT AIDS DRIVING AT NIGHT

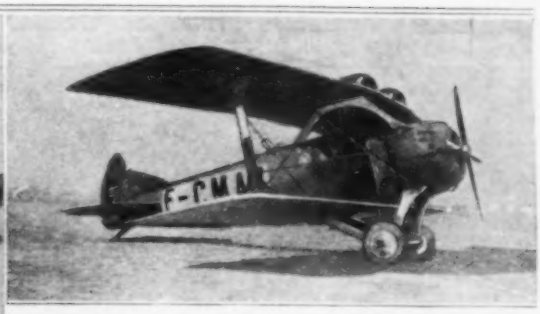
Night driving over country roads has been greatly aided by the introduction of a headlight improvement which can be easily and quickly mounted on any car. The accessory reflects the light so that the road ahead, the wheels, the ditches at the sides, and any oncoming machine are seen simultaneously. Glare is prevented from showing above a 42-in. height, thereby eliminating the blinding of an approaching motorist and reducing the possibility of an accident which often results from a careless use of the "bright lights."



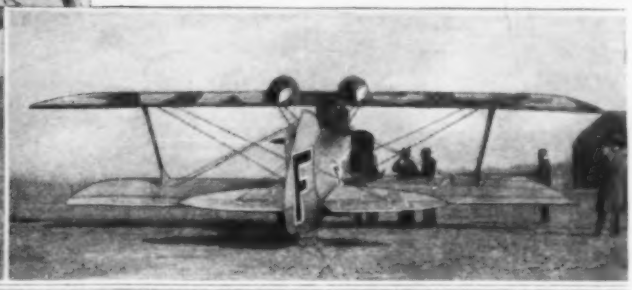


At the Left is Shown the Saw with Which Work Similar to That Done on a Shaper, or a Milling Machine, can be Accomplished. At the Right are Seen Specimens of Numerous Kinds of Work Completed with the Shaping Saw





This Five-Passenger Spad-Herbemont Plane is Flying on Many of the European Air Routes, and is Powered by a 250-Horsepower Engine, Driving a Four-Blade Propeller



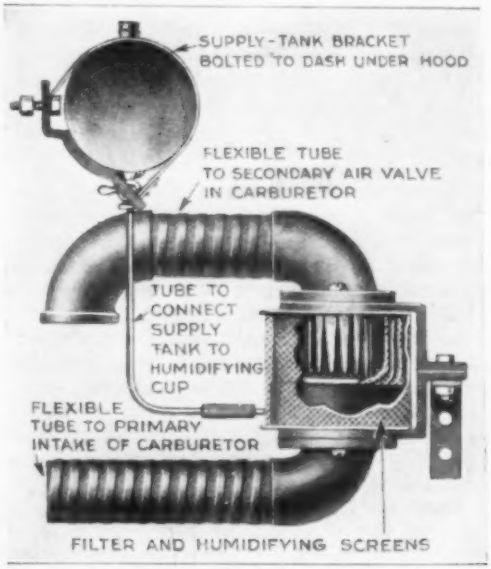
PHOTOS COPYRIGHT, M. ROL

NEW SPAD-HERBEMONT PLANE FOR EUROPEAN AIR LINES

A new Spad airplane of remarkably clean lines has recently made its appearance on many of the European air routes. The passenger cabin, entirely inclosed and accommodating five persons comfortably, is situated between the wings and just back of the engine compartment. The pilot's cockpit is located farther back in the fuselage. Power is furnished by one 250-hp. motor, and the plane carries sufficient fuel for a flight of 6½ hours with five passengers. The flying speed is about 110 miles per hour, with a motor speed of only 1,450 revolutions per minute.

AIR-STABILIZING ATTACHMENT FOR AUTO CARBURETORS

Complete combustion of the fuel in an automobile engine, under all varying conditions of atmospheric temperature and density, requires some mechanical means of stabilizing the air so that it carries always the same proportion of oxygen. An air stabilizer has been constructed for this purpose that can be connected to any carburetor. The air passing in on all sides of the cylindrical device is first dry-filtered by an outside screen, from which it passes through six humidifying screens that are kept constantly moistened by capillary attraction from a bowl of water below them. The supply of water in the bowl is maintained from a tank bracketed to the dash under the hood. Thus the temperature and condition of the air that passes to the carburetor are kept uniform under all atmospheric conditions.



Air Stabilizer for Connection to Carburetors, Fully Explained by Notations: Outside Filter is Cut Away to Show Humidifying Screens and Internal Construction

SIXTY-MILE BEACH USED AS TRACTOR ROUTE

Above: One of the Machines Using the Beach as a Tractor Highway. At Low Tide the Hard-Packed Sand Makes an Ideal Road for the Tractors. Left: Map of the Coast, with the 60-Mile Beach Heavily Shaded

Along the California seacoast, extending from Capistrano south to Morena, there is a piece of level coastal plain, some 60 miles in length and about five miles wide, which is given over almost completely to the growing of navy beans. The bean farms are of vast acreage, and tractors are used almost exclusively for cultivation. A paved motor highway runs north and south through the entire length of this bean country, but the tractor men are forbidden to use this highway because of the damage they inflict to the pavement if they do not go to the trouble of removing the cleats from the bull wheels of their vehicles. Obviously, the exclusion of the tractors from the highway inflicted a serious handicap upon the farmers in getting from one field to another, and from farm to farm, with their ponderous vehicles. The difficulty was made all the worse by the fact that most of the farmers do not own the tractors, but let their work to several different firms doing business in the tractor cultivation of lands.

For several years the farmers have struggled along, getting their tractors from farm to farm as best they could. For the most part the tractors have been loaded onto motor trucks, and thus transported with the expenditure of considerable labor and money. Recently, however, the problem of tractor transportation from farm to farm vanished with the discovery, by one of the tractor men, that the hard sand along the seashore at low tide offers a convenient tractor highway up and down the entire length of the bean country. The tractors may drop down onto the seashore from almost any farm in the 60-mile stretch, and once there, at low tide they have an easy route to any other farm in the system, without any physical or legal difficulties.

THE CULTURE OF PECAN TREES TO BE TRIED IN CHINA

Encouraged by the success of the pecan growers on the western coast of the United States, an attempt is to be made to introduce the culture of pecan trees in China. The College of Agriculture of the University of Nanking is distributing seed nuts at a nominal price to farmers or persons who are interested. Planting and culture directions are also furnished.

COLLECTING GAS-MAIN "SWEAT" FROM DRIP WELLS

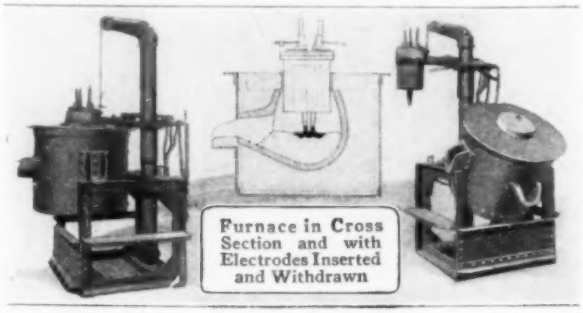
Soon after gas leaves the holder it begins to "sweat." The cooler walls of the mains cause a condensation of gas moisture that must have an outlet or the underground pipes will quickly fill with this liquid. For this reason gas mains must be laid with sufficient fall to drain the accumulating condensation into drip wells located at certain points in the system. These wells, or siphons, as they are sometimes called, have varying capacities, some of them in the largest city mains holding several hundred gallons. They are usually constructed in the form of a huge drum, having a gas-main outlet on opposite sides and another smaller standpipe leading to the manhole in the street above, so that the drip water can be pumped out. The wells must have considerable excess capacity, as the quantity of water often varies many gallons during the course of a day. Underground temperature may increase or decrease the flow without any apparent change in street-surface weather conditions.

The deepest and largest drip well in Brooklyn, N. Y., situated near the southeast entrance to Prospect Park, is 40 ft. below the street, and often yields 200 gal., or more, at each daily pumping. Formerly, the pumping of all the drip water was done by hand, but the motor of a 788-gal. tank wagon now does this work for all except this deepest well. Its drip water must be hand-pumped, as the motor pump has not enough pressure. The greenish-yellow fluid pours into a bucket, from which it is sucked by the motor pump. Drip water smells strongly of gas and is extensively used in the making of high explosives, such as trinitrotoluene.

Hand-Pumping the Drip Water from One of the Drip Wells into a Bucket, from Which the Water is Pumped by a Motor into a Tank Truck: The Insert Shows a Cross Section of the Drip Well

ELECTRODES SELF-ADJUSTING IN ELECTRIC FURNACE

Self-adjusting electrodes are the feature of a new electric furnace, and these are counterweighted so that the lower ends swing together in contact when the current is off. The counterweights can be regulated so as to draw any predetermined amount of current desired from a three-phase line. When the power is switched on, the electrical repulsion and the formation of gases between the carbons immediately force them apart a distance proportionate to the strength of the current. Should the power be reduced, the carbons are automatically drawn closer to each other, which prevents the breaking of the heating arc. Thus the outfit may be operated as either a "direct-arc" or as an "indirect-arc" furnace, depending on the kind of metal to be melted.



Furnace in Cross Section and with Electrodes Inserted and Withdrawn

"COPYRIGHT LAW" OF NORTHWEST INDIANS

Strict Rules—in Effect a Copyright Law, Although Inspired by a Different Motive—Protect the Totem Poles of Individual Clans against Imitation

BY FRANCIS DICKIE

THAT a "copyright law," very similar to that in force among the civilized nations of the world, existed among the primitive Indians of northern British Columbia and Alaska long before the white man came, is a remarkable fact which the correspondent of Popular Mechanics discovered recently while traveling through the northern wilderness region of British Columbia in company with William Beynon, of the Canadian ethnological research. Mr. Beynon is one of the greatest living authorities on the native peoples of this region. The copyright law's existence is in connection with the totem poles, those symbols of totemism which are peculiar to northern British Columbia and Alaska; in fact in no other place in the world did primitive men make representation of totem designs in any manner nearly resembling the immense cedar poles of the northern part of North America. The strange thing is that though much has been written of totem poles, and some pictures of them shown, the existence of copyright has been entirely overlooked. In fact, the meaning of these poles, and the strange ceremonies attaching to them, have never been made known to the general reading public.

COPYRIGHT, WM. BEYNON

The Haida Tribe of the Prince of Wales Archipelago, Alaska, Had a "Copyright" on This Design of Totem Pole, Featured by the Very Unusual Addition of a Canoe

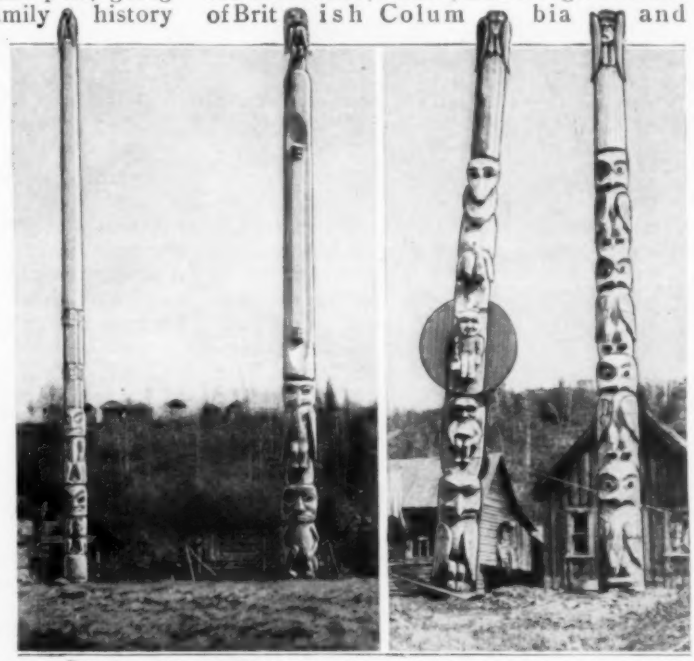
Herewith is given for the first time the story of how these primitive peoples of North America instituted a copyright law along exactly the same lines as followed by the white men today.

To be the owner of a totem pole was a sign of social position, rank, wealth, and power. Every native above the slave class aspired to raise one some day. In the erection of the pole a great amount of wealth had to be lavished; the more wealth lavished, the greater the owner's standing in the community. The reader, noting the accompanying photographs, will see how some are much plainer than others. But from the fact that one pole has less carving work done upon it, it must not be inferred that the plainer pole cost less in ceremony. Sometimes a very plain pole represents a greater outlay than a very extensively carved one.

When a native decided he would have a totem pole, he and his family, and sometimes, in the case of a great chief, the whole clan, set about gathering wealth to meet the occasion. These preparations usually began a year in advance; in some cases so long a time as three years was spent in preliminaries. While this was going on, the prospective owner called in the artist of the tribe, a man of a distinctive class whose wages were very high. To the artist the prospective owner related all the traditions of each figure and crest he wished carved. The artist then started to work, spending sometimes months on the intricate designs necessary. His work was made highly difficult because he must not in any way duplicate any carving already in existence in the region. This rule was very rigidly enforced, marking the first workings of the copyright law in North America. When the artist had completed his labors, the prospective owner next called the song composer, and to him in turn related the traditions connected with the various figures. The appointed composer went away in solitude and created themes and words to suit the various carvings. When his composing was completed he returned, and the prospective owner called in the singers of his house, varying in number from ten to a hundred. The composer at once began rehearsal with these men and women and continued till they were thoroughly trained. The songs became the property of the owner of the pole; the composer did not receive royalty.

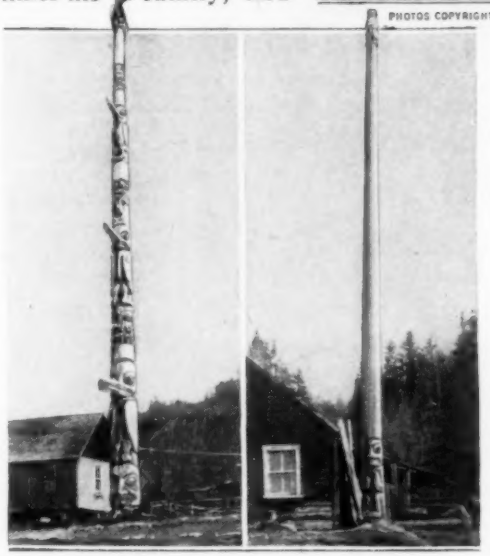
Shortly before the day on which the pole was to be erected, the owner sent out messengers summoning near-by tribes. When these were assembled before his house, the owner intrusted to some tribe he particularly wished to honor, the raising of the pole. When this had been set in the ground, the owner related at great length and with considerable oratorical vigor the tradition attaching to each figure and crest carved on the pole, going into great details of his family history to demonstrate his right to carvings, and further declaring them his particular property. This constituted the registering of copyright. This done, all the gathered people were invited into the owner's house and seated according to rank. Then began the really expensive part of the ceremony, the presenting of gifts gathered in the last year or more. In days before the white man came, these consisted mostly of furs, sometimes rare foods and canoes. In recent times, the gifts have been white man's blankets and money. In making this great display, a native would impoverish not only himself, but sometimes his family, and even clan. At the conclusion of the gift giving, great quantities of food were handed around. The eating concluded, the singers then related the history of the pole and its owner's rights to the various designs in use upon it, in which words and music they were so thoroughly drilled by the composer. They also declared the owner's sole right to these songs.

Thus the totem pole was erected among the Tsimshian, Haida, and Tlingit Indians of British Columbia and Alaska for hundreds of years before the white man came, and copyright declared upon totem-pole designs and songs.



PHOTOS COPYRIGHT, WM. BEYRON

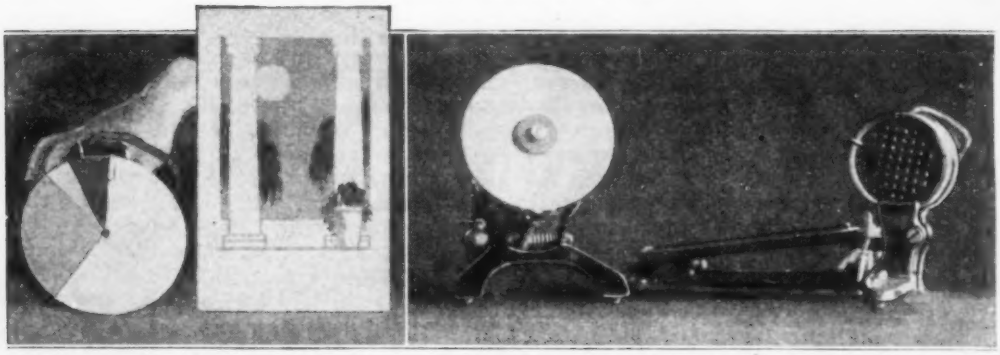
These Four Poles, Executed by Various Clans of the Tsimshian Tribe, While Showing the General Characteristics of Totemism, Well Illustrate the Individualism That the Stringent Copyright Rules Enforced



Left: Another Tsimshian Pole. Right: The Tlingit Tribe is Represented by This Simple Design

The past tense has been used throughout, for though an odd totem pole may still be raised among some of the very primitive tribes, the custom has practically passed, through the natives' intercourse with the white man. In fact, the Canadian government has stopped the natives impoverishing themselves by such ceremonials, which have been commonly known among white men as "potlatches," though their significance has been entirely lost upon the egotistical white man, for the most part too contemptuous of the native to inquire closely into his doings.

So, soon the Indians who first introduced the law of copyright will cease to need it.



Left: A Magazine Cover and a Color-Harmony Testing Disk, on Which the Colors are Arranged in the Same Proportion as They are Used on the Cover. The Disk is Then Placed on the Machine and Revolved Rapidly, and the Resulting Color Determines If a Proper Harmony Exists. Right: The Revolving Disk and Control

TROUT SORTED INTO SIZES BY ROLLER "SIEVE"

Trout will automatically sort themselves into different sizes at the fish-hatchery pools, if a lately invented roller "sieve" is installed. The outfit consists of a boxlike structure, in one side of which are fitted numerous tubular brass rollers. When the sieve is placed in a trout pool, the fish, following their instinct to swim upstream, always attempt to get through the rollers. With the boxes set in various locations in the pool, connected by channels through which a current of water is flowing, it is said that in 48 hours the trout will have sorted themselves into their several sizes.

HARMONY OF COLORS TESTED BY REVOLVING DISK

It is a well-known fact that a pleasing harmony of colors attracts the eye much as musical harmony pleases the ear. In order to test the harmony of color combinations, a machine has been devised with which a colored disk is revolved rapidly so as to cause the colors to merge, and this visual mixing of the colors gives the same result to the eye as would the actual mixing of the colored inks themselves. When a disk made up of the proper areas of harmonizing colors is revolved, a pleasing shade of gray develops. If this pleasing gray does not develop, it shows that a wrong combination of colors has been used, and that the color scheme is not attractive to the visual sense.

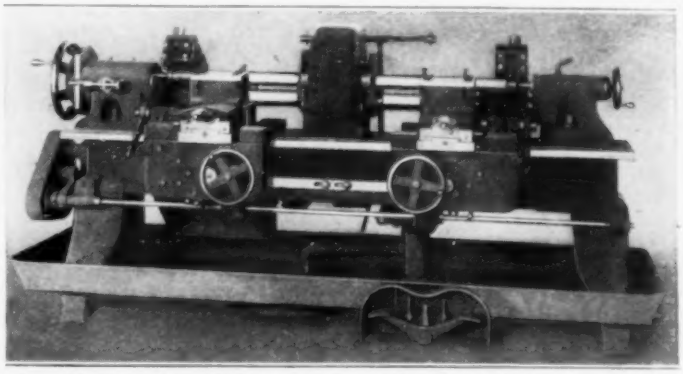
COIN-COLLECTING APPLIANCE FASHIONED LIKE SCOOP

A new coin-collecting appliance has recently appeared on the streets of Boston, Mass., and was invented by a man of that city. The outfit is made of tin fashioned in the shape of a large scoop, open at the top, in which the passers-by are asked to toss pennies, or larger coins, for the benefit of disabled soldiers.

¶The development of an electrochemical process for the manufacture of metallic calcium and of 97.5-percent caustic soda, free from chloride of soda, has recently been announced. The new process is claimed to be much cheaper than those now in use. Further information may be obtained from the fuel division of the Department of Commerce and Labor.

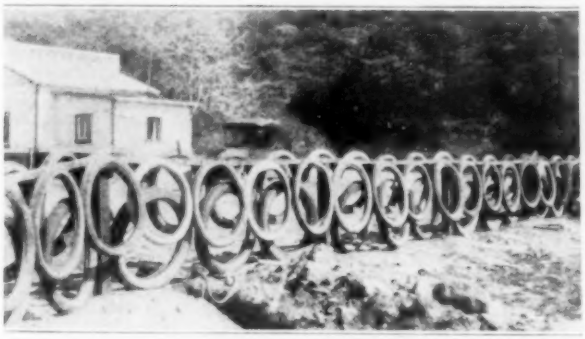
MACHINE WITH CENTER DRIVE LIKE TWO LATHES IN ONE

A new type of lathe with the headstock and drive at the center, and a tailstock at each end of the machine, is now on the market. The headstock is very short, and carries a chuck at each end of the spindle, which is of cast iron and hollow. It is driven by a motor attached to the rear side of the lathe bed, and controlled by a treadle at the front of the machine. There are two carriages arranged to receive special magazine toolholders and with automatic-feed devices. They will operate simultaneously at each end of a piece of work. The machine is specially adapted for turning shafts, such as axles, where no work is to be done at the center portion, but similar work at each end.



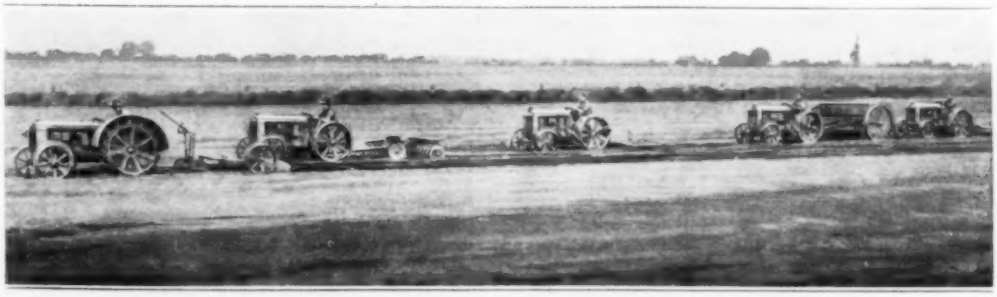
Front View of Center-Drive Lathe, Specially Designed for Turning Both Ends of Any Kind of Car Axles: Its Central Headstock Is Very Short

WORN-OUT AUTOMOBILE TIRES USED TO BUILD FENCE



Fence Constructed of All Sizes and Makes of Discarded Automobile Tires Which have been Nailed to the Wooden Railing. Nearly 300 Tires, Whose Original Value has been Estimated at More than $6,000, Form This Strange Fence

Worn-out automobile tires have been used in the construction of a strange-appearing fence around an oil-service station in one of the western states. This station is situated in a rather remote locality, and as touring motorists purchased new tires, they usually gave the old ones to the service man. Instead of selling them for junk, the service man constructed a fence having 4 by 4-in. posts and a 2 by 3-in. railing, into which spikes were driven to support the hundreds of discarded tires of all sizes and makes.



FIVE TRACTORS REDUCE FARMING TO A SINGLE OPERATION

EMPLOYING five tractors for only a few days in the spring, a western rancher performs at one time all the operations of spring planting on a 1,500-acre farm. The first tractor pulls a gangplow which turns the earth; the second draws a disk harrow, and the third pulls a spiked cultivator which finishes the preparation of the soil. The fourth tractor draws a seeding machine, while the fifth tractor, bringing up the rear of the procession, pulls a drag for covering the seed.

TINY PILE DRIVER DRIVES PIPES AT POLE BASE

Much of the labor and 90 per cent of the time required to drive ground pipes at the base of poles along electric trans-

Miniature Pile Driver, Illustrating the Method Employed by Linemen in Driving Ground Pipes Instead of Using the Sledge Hammer

mission lines have been eliminated through the invention of a portable pile driver. It trims down the old working time of two hours to 10 or 15 minutes, depending on the nature of the soil in which the work is done. The old method was slow, clumsy, and exhausting. The workman was supported by climbers and a safety belt, and while thus held in position, he had to swing a heavy sledge. Often, because of his failure to strike a square blow, the pipe was bent or mashed. The new device consists of a piece of lineshaft, about 3 in. in diameter and 18 in. long. It is attached to a steel guide rod that will enter a 1-in. pipe without rubbing. At the other end, an eyebolt allows a rope to run through a pulley, suspended from the crossarm, to the ground man. The latter, by pulling down on the rope and releasing it, drives the pipe from 6 in. to 12 in. at each stroke. The new method protects the worker and keeps the pipe and pole in better condition.

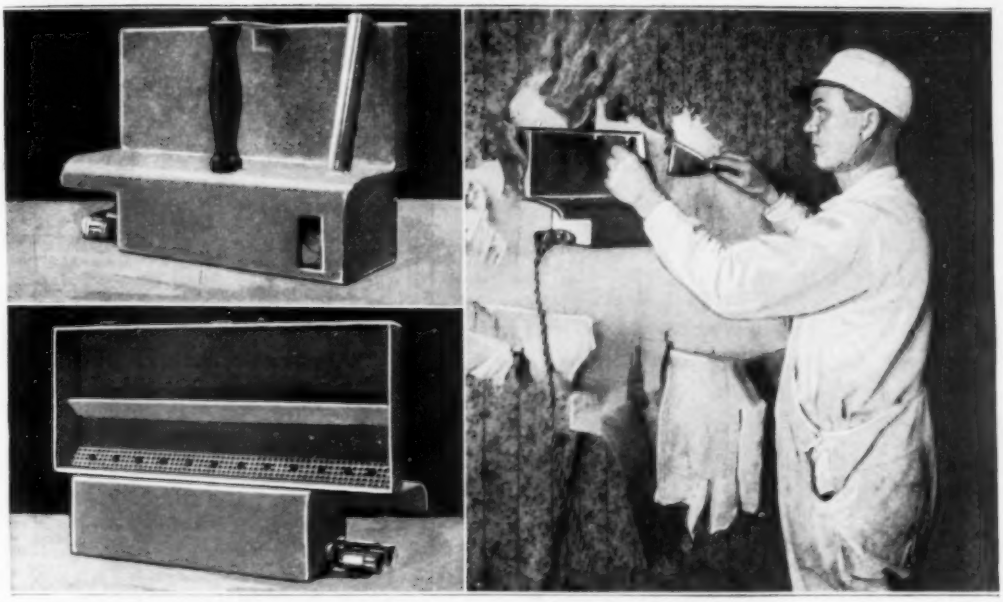
PROCESS FOR THE RECOVERY OF OXIDIZED COPPER

A patent has been granted on a process for the recovery of copper from oxidized ores in which the basic reactions are between the copper, metallic iron, and a little free acid. The finely crushed ore is heated to about 70° C. (150° F.) in agitating tanks containing finely ground metallic iron and a small amount of ferrous sulphate. The copper is precipitated as a cement copper, and can be recovered either by washing or by flotation. The process is a regenerative one, it being necessary only to add metallic iron with each new charge.

PROPELLERS CIRCULATE AIR TO HEAT ORANGE GROVE

Saving the citrus fruit from damaging frosts is the aim of a California inventor who has produced a huge fan, or propeller, which is mounted on a 20-ft. tower. An electric motor is installed to drive the propeller blades, which are so constructed that they draw the warmer air from above, and circulate it throughout the grove. In extremely cold weather, large heaters will be placed under each fan, and it is claimed that four towers of this description are sufficient to serve a 10-acre orange grove.

Large Propellers, or Fans, are Mounted on High Towers for the Purpose of Saving the Citrus Fruit from Damaging Frosts



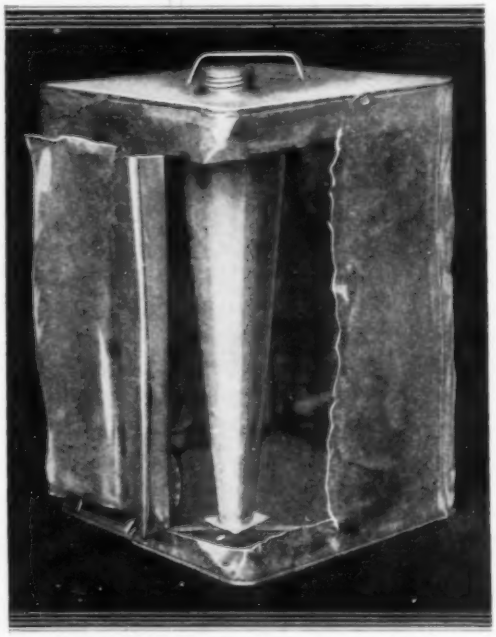
Left: The Back and Front Views of the Machine Give a Good Idea of the Heating Space and the Steaming Compartment. Right: In Operation the Tank is Filled with Water, and the Cord is Attached to Any Light Socket. The Resultant Steam Quickly Loosens the Paper, Thus Facilitating Its Removal

AN ELECTRIC STEAM MACHINE FOR REMOVING WALLPAPER

The tedious task of removing wallpaper can be made a comparatively simple operation by the use of a recently invented machine. This little device weighs only 3 lb., is easily portable, and operates from any electric-light socket. It is equipped with an electric heating element to generate the steam, which penetrates and loosens the wallpaper, making its removal a simple matter. It operates equally well on the walls or ceiling, and because of its construction is not a fire hazard, the temperature never being higher than the boiling point of water.

BOOTLEGGERS USE TRICK CAN FOR SWINDLING CUSTOMERS

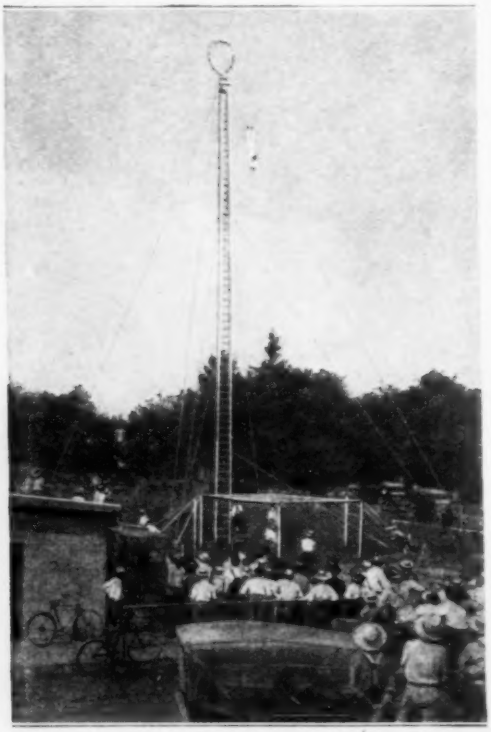
At Newark, N. J., the weights and measures officials seized 42 short-measure 5-gal. cans which were apparently designed to perpetrate a profitable bootlegging fraud. A small chamber of about a quart's capacity was provided just below the screw-top opening, which was to be filled with liquor, the remainder of the can being filled with water. The customers were allowed to draw from the can a sample of the excellent liquor placed in the small cavity, and gain the impression that the can contained 5 gal. of it. This they would pay for, later to find that they had been defrauded. Evidently the perpetrators trusted that the illegal nature of the purchase would restrain the victims from advertising the nature or existence of the swindle.



Five-Gallon Can with Sides Cut Away to Show the Arrangement Devised for Swindling Purchasers of Liquor: The Small Cavity Just below the Screw Top was Filled with Whisky, the Remainder of the Can Containing Water

SPECTACULAR JUMPING STUNT FINALLY ENDS IN DEATH

Spectacular jumps, or dives, from a small platform placed at the top of an 80-ft. ladder into a net below, was the



Spectacular Jumper Shown in Mid-Air Just After He has Dived from the Small Platform at the Top of the 80-Foot Ladder

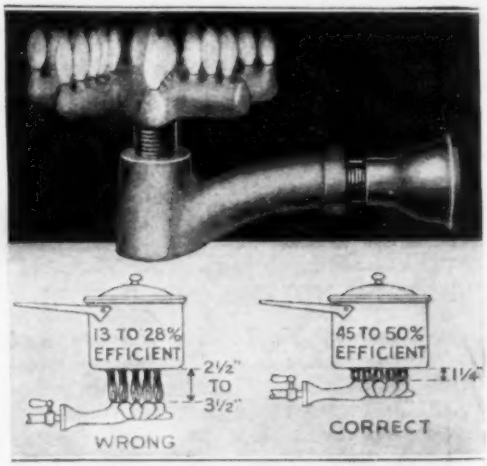
chosen occupation of a father and three sons in different parts of the country. Advertised as the main attraction at county fairs and exhibits, these men pursued their hazardous calling until finally each, through slight miscalculation, failed to land in the net and was instantly killed.

PRESERVING CRYSTAL PALACE TOWER TANKS FROM RUST

Everyone who has seen the world-renowned Crystal Palace, near London, Eng., which was, 70 years ago, the first structure ever built for an international exhibition, will remember the great crystal towers that flank either end of the main building. Each of these high towers, built entirely of glass in what looks like a very slender iron frame, carries at its top a wrought-iron tank, 47 ft. in diameter and 38 ft. deep, with a capacity of 250,000 gal. of water, which is the source of supply for fire hydrants, for blowing the great organ in the palace, and for the extensive fountain system in the palace grounds. Recent examination showed that the long-continued process of rusting had reduced the thickness of the tank walls from 25 to 30 per cent. On account of this dangerous weakening of the tank plates, it is now proposed to reduce the water pressure within them by reducing their depth. This would be simple enough if it were not for the fact that a weight equal to the weight of the tanks when filled with water is needed as stabilizers for the towers that are so large in proportion to their small weight. Therefore the difficulty is to be overcome by filling a large part of each tank with cement, which will reduce the water pressure in the tank while maintaining the pressure at the points of delivery due to the water head.

GAS BURNER IS ADJUSTABLE FOR ANY PRESSURE

High gas bills are caused chiefly by the gas burner being more than 1¼ in. from the cooking utensil, according to recent investigations made by the Department of Agriculture, the Bureau of Standards, the Bureau of Mines, and the Ohio State University. As a remedy for this condition, a burner has been produced that can be adjusted to give the correct



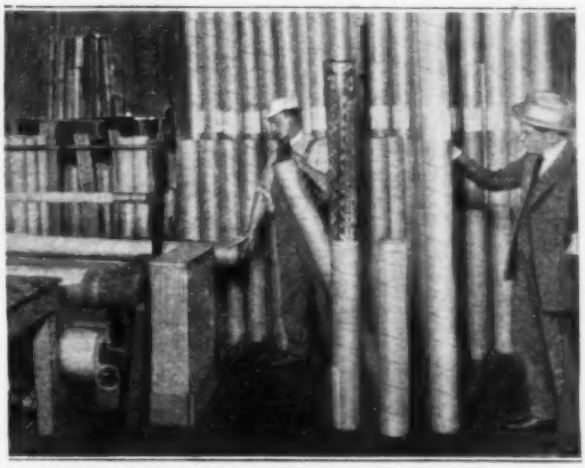
At the Top is Seen the Adjustable Gas Burner Which can be Screwed Up or Down, to Reach the Correct Position Shown Below

height of flame, by being screwed either up or down, in accordance with the pressure, and which can be fitted easily to any gas range now on the market in a short time and with but slight cost.

PACK RUGS IN PAPER TUBES FOR SAFE SHIPMENT

Packing rugs in paper tubes so that they will be kept clean and protected from injury during shipment, is the method employed by a western concern. The tubes are of a suitable diameter, in length equal to the width of the rug being shipped, and made in two sections. Either of the sections can easily be removed by the dealer for display purposes, and then be replaced for delivery or reshipment.

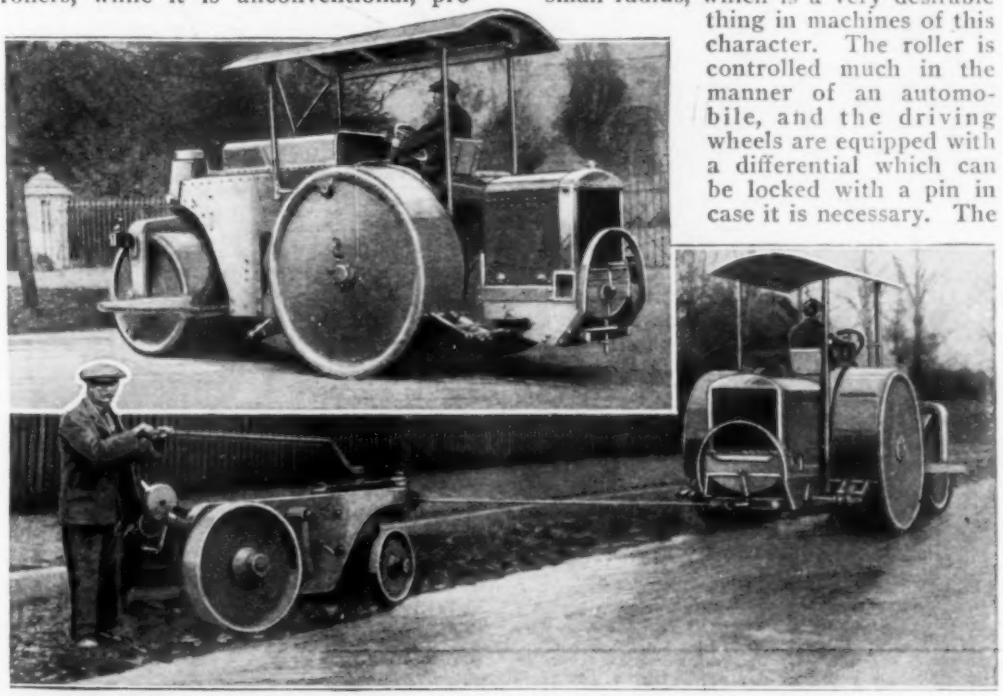
¶A British concern has succeeded in producing a paint pigment of white oxide of antimony which has none of the unsatisfactory features of paints formerly made with this compound. Paint made with it is said to be nonpoisonous.



Paper Tubes in Which Rugs are Packed for Safe Shipment: One Section of the Tube can be Removed for Display Purposes

THREE-WHEEL ROAD ROLLER HAS ENGINE AT REAR

A new design in gasoline-driven road rollers, while it is unconventional, produces a machine of exceptionally short wheelbase by placing the engine at the rear. This feature makes a very flexible machine, capable of turning in a small radius, which is a very desirable thing in machines of this character. The roller is controlled much in the manner of an automobile, and the driving wheels are equipped with a differential which can be locked with a pin in case it is necessary. The engine, transmission, and control are mounted on a subframe which is carried on three-point suspension.



Above: By Placing the Engine at the Rear of This Three-Wheeled Gasoline Road Roller, the Wheelbase is Greatly Reduced, with a Consequent Increase of Flexibility. Below: Drawing a Scarifier. The Short Turning Radius Makes This Roller Particularly Useful for Road Work

EMPLOY STEAM-OPERATED AX FOR CHOPPING REDWOOD

Because of its fire and acid-resisting qualities, redwood bark is a desirable material for use in the manufacture of felt for roofing material, but it must be reduced to small pieces before going to the pulp machines. As a first step in the operation, one company uses a steam-operated ax for chopping the large slabs of bark as they are received. The steam ax is patterned after the familiar steam hammer, but is equipped with a four-bladed bit for cutting. A heavy shield and screen protect the operator.

This Steam Ax Operates like a Steam Hammer, and is Equipped with a Four-Bladed Bit for Chopping Redwood Bark to be Used in the Manufacture of Roofing Material

NEW NONINFLAMMABLE GAS PRODUCED FOR AIRSHIPS

Announcement has recently been made of the production of a new lifting gas for airships which is claimed to be non-inflammable and nonexplosive, and to have a lifting power almost equal to pure hydrogen. The gas is made by an electrolytic process, and it is said that it can be produced at a much lower cost than an equal quantity of helium gas produced at the Fort Worth helium plant.

STAINS ON LEATHER REMOVED BY SOLUTION OF RUBBER

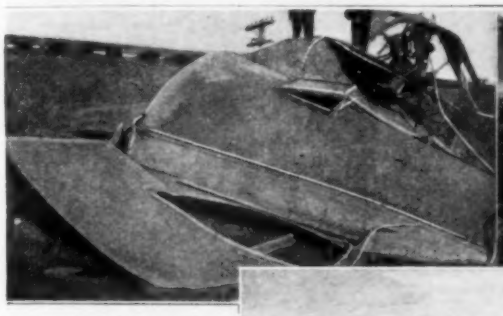
New methods for the removal of stains from leather goods have been developed by the Bureau of Chemistry of the Department of Agriculture. For the removal of grease spots of any kind from any leather article, the best method has been found to be to coat the leather with a thick solution of rubber, in which the solvent evaporates rapidly. When almost dry, this coating peels off quickly and removes the grease stains with it. In exceptional cases it may be necessary to repeat the operation several times. The solution recommended is composed of unvulcanized Para or Ceylon rubber in the proportion of one part to ten, by weight, of carbon bisulphide. The fumes of this solvent are very inflammable and poisonous, and it is, therefore, essential to work at a distance from fire, and where the ventilation is good. Just before applying the solution, the leather should be made slightly wet to prevent too strong adhesion.

SHOW HOUSE NUMBER ON CURB TO GUIDE MOTORISTS

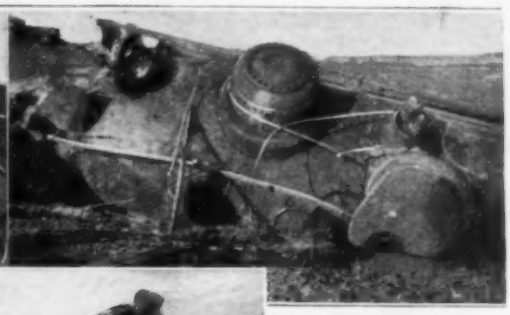
No longer will the motorist driving in a strange neighborhood be compelled to peer along from house to house searching for the number, if a system devised by a western man is adopted. With a set of stencils he marks the house number on the curb in figures that are plainly visible from a passing automobile, lampblack and oil being used for the marking.

¶ France has decided to sell her government-owned railroads, as the operation under government ownership has not proved entirely successful.

LOCOMOTIVE EXPLODES WITH UNUSUAL VIOLENCE



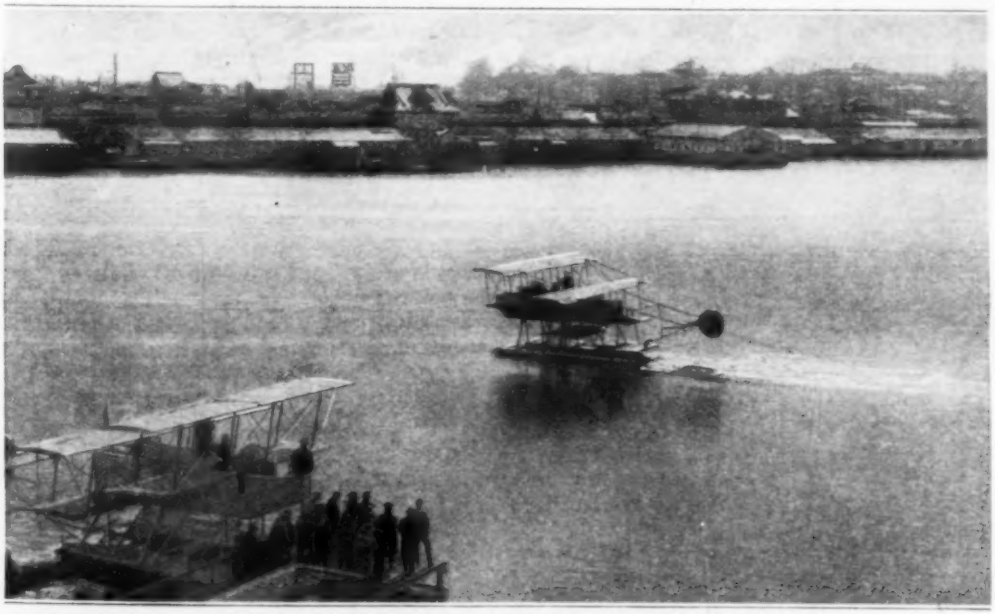
Top of the Cab Blown 25 Feet across the Track, When the Locomotive Boiler Exploded with Great Violence While on the Track



The Locomotive Boiler That was Blown Clear of the Frame and Hurled to a Distance of 100 Feet, is Shown Where It Landed

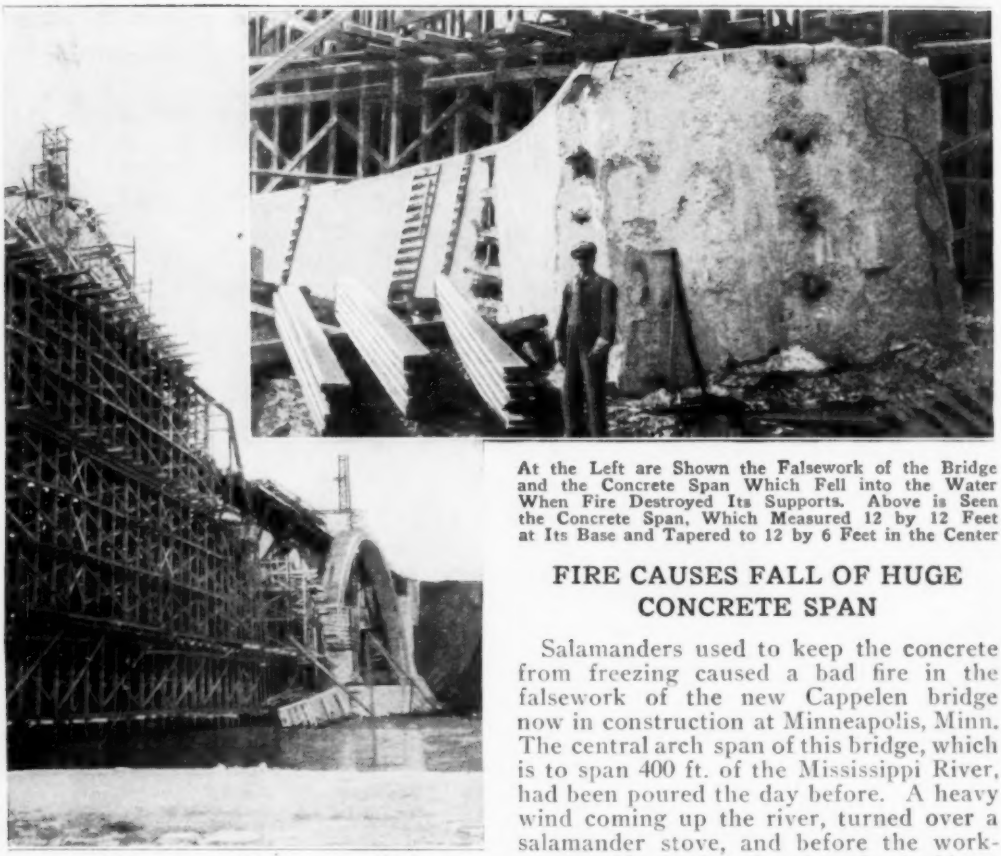
Locomotive Frame and Part of the Smoke Box That Remained Standing on the Track After the Boiler Exploded: The Engineer was Killed and the Fireman Injured

While standing on a siding at Egypt, Miss., the boiler of a Mobile & Ohio locomotive recently blew up, killing the engineer, injuring three other men, and wrecking the locomotive in a most sensational manner. The boiler itself was blown clear of the frame to a distance of 100 ft. The top of the cab was blown 25 ft. across the track. The locomotive frame and running gear, with part of the smoke box, remained on the track. The force of the explosion was so great that windows were broken two miles away.



JAPANESE HYDROGLIDER IS BUILT LIKE AN AIRPLANE

AN amusement device has made its appearance in Japan which gives nearly all the thrills of flying but with the element of danger practically removed. It consists essentially of a tandem biplane carried on a float and propelled by an airplane motor. It has a seating capacity of about 20 persons, and instead of rising from the water, it glides over the surface at a fair speed.



At the Left are Shown the Falsework of the Bridge and the Concrete Span Which Fell into the Water When Fire Destroyed Its Supports. Above is Seen the Concrete Span, Which Measured 12 by 12 Feet at Its Base and Tapered to 12 by 6 Feet in the Center

SCREWDRIVER WITH HANDLE THAT IS ADJUSTABLE

Carpenters and mechanics will find useful a new screwdriver that is double-acting. It can be used like any ordinary straight-bit screwdriver, or by pressing a catch with the thumb or finger, the handle can be turned at right angles to the bit, enabling the operator to apply much more force, and thus do work with one hand that, with the old-fashioned tool, would require two hands, and possibly the help of a wrench besides.

FIRE CAUSES FALL OF HUGE CONCRETE SPAN

Salamanders used to keep the concrete from freezing caused a bad fire in the falsework of the new Cappelen bridge now in construction at Minneapolis, Minn. The central arch span of this bridge, which is to span 400 ft. of the Mississippi River, had been poured the day before. A heavy wind coming up the river, turned over a salamander stove, and before the workmen could guard against it, a fire had been started in the scaffolding and surrounding canvas. Firemen rushed to the scene, but difficulties in reaching the flame prevented its immediate extinction. Nearly half of the 400-ft. arch was torn loose from the piers, and fell when the falsework was burned from under it.

The damage done is to be repaired immediately, but no more chances are being taken on another such accident in the future. A fire hose has been placed ready for service at a moment's notice.

TO INVESTIGATE MIGRATION OF INSECT CORN BORER

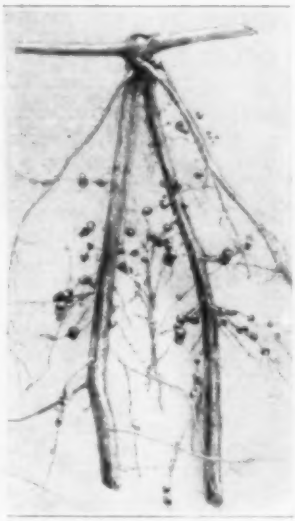
Because that insect pest, the European corn borer, has made its appearance in a narrow strip extending practically the entire length of Lake Erie, investigation is to be made to determine if the moths of this insect fly across the lake. If permission can be obtained, observers will be stationed at the lighthouses along the American shore, in the belief that the moths will be attracted by the lights.

KUDZU FORAGE PLANT AND SOIL BUILDER

By C. E. PLEAS

AN ARTICLE on kudzu, the remarkable forage plant which promises so much to North American agriculture, appeared in the July, 1919, issue of this magazine. It attracted widespread attention and was received with such eagerness that, departing from our customary policy, we are again covering the subject with an article written by Mr. C. E. Pleas, the man responsible for bringing the plant to the attention of the public and the recognition of the farming industry.—Editor.

RANKING high among the forage plants, kudzu might properly be called a typical American crop, not because it originated in America, but because it seems adapted to all well-drained soils in the United States, from coast to coast, and from the Gulf to northern Maine. No other fodder, hay, or pasture plant is adapted to such a wide range of territory, nor able to adjust itself to such a variety of conditions.



This Shows How the Roots Start from the Joints of the Vine with the Nitrogen-Gathering Nodules Appearing on the Roots

It is a perennial legume of most marvelous growth and hardiness, able to withstand the coldest as well as the hottest temperatures found in the United States. It does not require liming or heavy fertilization, nor is its growth restricted to some particular soil or climatic condition. Like other leguminous plants, it carries nitrogen-absorbing bacteria on its roots, making artificial inoculation unnecessary. It may be planted in poor, rocky, hilly, stumpy, or worn-out fields and still make a reasonable return in hay or pasture. It may be cut as hay at any time of the season regardless of the weather, as a shower of rain does not ruin it. And it is most palatable to all farm animals, and has a feeding value equal to the best wheat bran, containing as an average 17.63 per cent protein.

While kudzu is a perennial that trails on the ground, rooting at the joints, it is in no sense a pest, but can be easily kept in bounds or killed. It never spreads from seeds or underground runners, nor will a root sprout when cut off a few inches below the crown.

Under very favorable conditions, some remarkable yields of hay have been made, but under normal conditions kudzu should yield, in two cuttings a year, from four to six tons per acre. It cuts easily and does not drag ahead of the mower blade. It cures the quickest and brightest of any known legume hay.

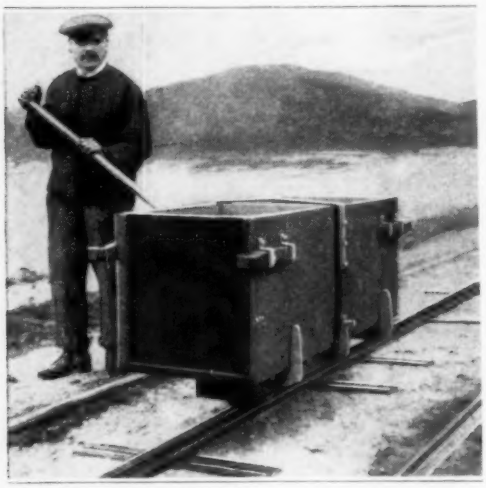
As a soil builder or reclaimer, it probably has no equal. It has immense roots

A Field of Kudzu Growing Waist-High: This Hardy Plant Needs No Cultivation, and Is a Soil Builder Because of Its Ability to Extract Nitrogen from the Air and Add This Essential Element to the Soil

that penetrate deeply into the subsoil, and through the medium of the bacteria on its roots has the power of extracting nitrogen from the air and adding this essential element to the soil. Yields of 40 to 50 bushels of corn are not unusual following kudzu.

MONORAIL DUMPING PUSH-CAR NOW IN USE IN GERMANY

For use on farms, as well as in industrial enterprises, a small single-rail dumping car has been constructed in Germany.



Monorail Push-Car Used in Germany: It is Pushed, and Also Dumped and Righted with the Pole Attached to One Side of It. It can be Slung on or off the Rail

A long pole attached to one of the four sides of the body of the car is used for pushing it, and also for dumping and righting it. The body is supported on small flanged wheels that travel on the single rail. It is also provided with a sling for lifting or removing.

RAPID METHOD OF CHANGING SCENES ON BERLIN STAGE

There has recently been completed in Berlin a series of experiments in theater craft that, it is predicted, will revolutionize the ordinary methods of scene shifting. The time and labor involved by these methods of changing scenery are completely avoided by placing on the main stage a number of smaller ones, each with a complete setting of scenery required by the different acts. These smaller stages are mounted on rails so that they can be wheeled back, one after another, leaving only the required setting in view of the audience.

SOAP BUBBLES USED TO STUDY EXPLOSION OF GASES

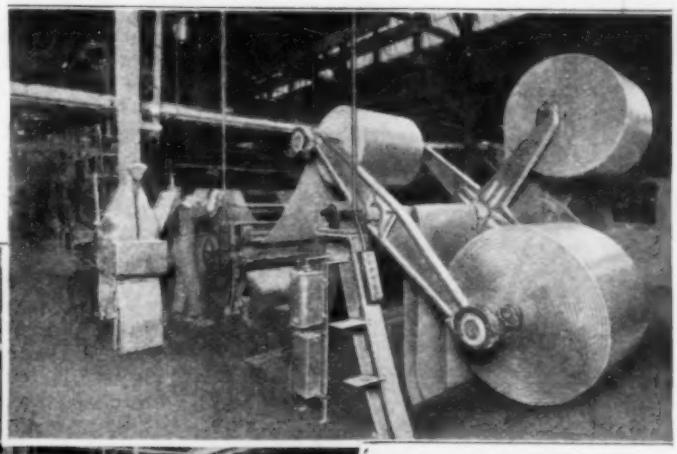
Everyone who buys gasoline for his automobile has a direct concern in the efficiency of engines, the study of which is being assisted by soap bubbles. These are now being used at the Bureau of Standards in determining the rate of propagation of flame in combustible mixtures of gases. Strangely enough, for years there has been sought a means whereby explosions could be studied under constant pressure free from complicating circumstances, but it was just recently pointed out at this institution that soap bubbles afford in ideal fashion just what is wanted.

In these experiments a bubble, about 8 or 10 in. in diameter, is blown with the gaseous mixture around a special form of spark gap, adjusted to its center. This is set up behind a screen containing a narrow horizontal slit on a level with the center of the bubble, and upon which is focused a camera. The film of the camera is set in motion in a direction at right angles to the slit, and a spark is passed through the gap, causing the bubble to explode. The progressive ignition of the gas appears through the slit as a line of light beginning at the spark gap and extending in both directions along the slit, and as the film is moving while this is going on, the resultant image on it takes the shape of a wedge, the exact form of which gives the data desired. Contrary to the results obtained under other conditions, the velocity of propagation in mixtures so far investigated is uniform.

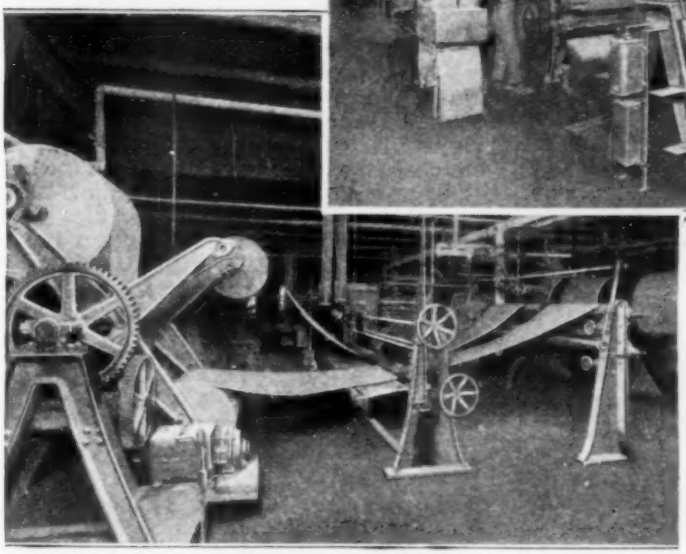
Photographic Record of Two Soap-Bubble Explosions Viewed behind Slit: The Straight Sides of the Wedge Indicate That the Explosion is Propagated Uniformly

USE ROLL-CHANGING MACHINE IN MAKING ROOFING

The base of many prepared roofings is felt which is treated with various substances to render it water and weatherproof. This felt is received at the manufacturing plant in large rolls, called "jumbo" rolls, which are unwound, and the strip of felt is passed through the treatment tanks. It is very desirable that this process should be continuous, so the rolls are carried on large spiders in such a way that as one roll is unwound another can be started through the tanks without stopping the machinery. The holder is so arranged that the new roll can be moved into position without being lifted from the floor, and the roll holder can be revolved when needed without interfering with the operation of the rest of the process.



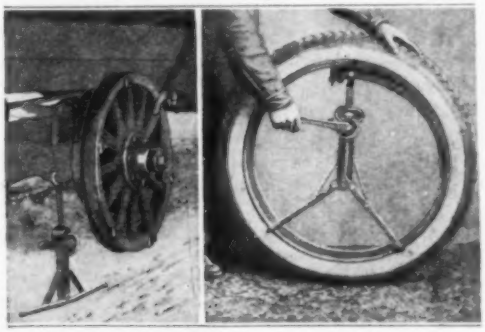
A Fresh Roll of Felt has Just been Placed in the Holder, and as the Upper Roll is Exhausted, the Holder is Revolved to Make the New Roll Available



The Roll of Felt Going to the Treatment Tanks is Nearly Exhausted, and the Roll Holder has been Revolved to Bring the New Roll into Position, Where It can be Started without Stopping the Balance of the Machinery, as It Is Desirable to Have the Process Continuous

TIRE REPAIR WITH COMBINED JACK AND RIM CONTRACTOR

For the motorist, a handy tool that serves two purposes is a combined jack and rim contractor to facilitate the removal of a tire for repairs. The jack is of the gear-operated screw type, the operating gear in connection with the hand lever being engaged by a double pawl, allowing the jack to be used for pushing when it is lifting the car, and for pulling when it is contracting the wheel rim. At the base of the jack are two pivoted arms with braces that slide in a rack on each side of the jack, so that these arms can be extended horizontally to support the jack when lifting the car, or at an angle of about 45°, so that their ends can be hooked over the wheel rim when used as a contractor. At the end of the jack is also a hook which engages the top of the rim and pulls it downward.



Combined Jack and Rim Contractor, Shown at Left in Use as a Jack, and at Right as a Rim Contractor, to Facilitate Tire Removal for Repair Work

LADDER HAS AUXILIARY LEGS TO PREVENT ACCIDENTS

Accidents may be prevented by the use of an adjustable ladder fitted with auxiliary legs for the purpose of assuring a firm support on ground that is not level. The legs, of which there are three, are fastened to the ladder body, one on each side at the base and the other at the top, and the former can be adjusted along the sides as desired, being held firmly in place by a sliding spring-pawl arrangement. For carrying, the legs are folded.

Ladder with One Side off the Ground, but Firmly Supported by the Auxiliary Legs and the Rear Leg

Above, the Ladder is Set Up on Uneven Ground, and Below, It is Folded for Carrying

"SURVEYING" TEST DRILL HOLES AN INTERESTING PROCESS

In examining the structure of a rocky crevice in a proposed dam site on the Colorado River, in northwestern Arizona just recently, engineers made the usual test drill holes in the bottom to a depth of from 50 to 100 ft. Desiring to check the theory that the stream crevice or cañon itself might be a fault line, slanting drill holes were made, in both directions, athwart the stream, to a sufficient depth to intercept the fault escarpment beneath the water, if any were present.

At first thought, it might be assumed that such drill holes would sag, and curve downward with the weight of the drills and drill rods, though the fact is, the whirling of the drill rods and their knocking against the walls of the drill holes, tend to lift the drill point so that the drill hole curves upward; the nearer the horizontal, the greater the rise per unit of distance, ordinarily.

"Surveying" the drill hole is the determination of the exact direction and position of the drill hole at all points, whether to right or left, or above or below the line projected from the starting point of the drill hole. To do this apparently impossible job of measuring, it is only necessary to fill a long slender glass tube or bottle with hot water, containing a small amount of melted paraffin and also a floating spirit level, with a compass needle attached, the spirit level being so adjusted as to float in liquid with the bubble in a central position. This bottle, by means of a bail or attachment, is let down on a measuring line, and brought to a stop at certain intervals, usually not less than 5 or 10 ft. Here it is held quietly until the paraffin sets by falling temperature. On being hauled to the surface, it is easy to bring the spirit level to a level position, and the compass, compared with a free compass, into the magnetic path, and obtain the angle of the hole at that point, from both base lines, vertical and horizontal. This is repeated for the entire length of the hole, and its exact position charted.

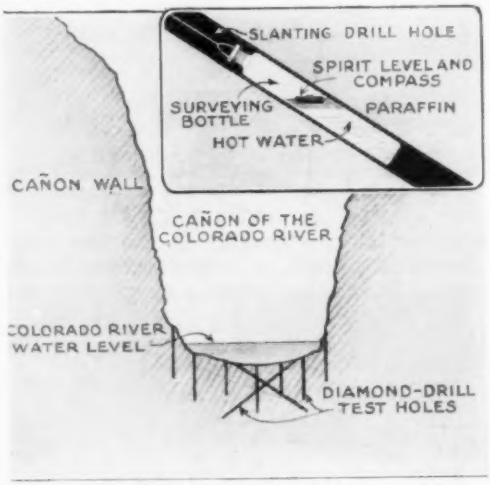


Diagram of Slanting Drill Holes Which were Made to Test the Rock for a Dam Site: Insert Shows Method of Surveying Holes

Write our Bureau of Information, if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.

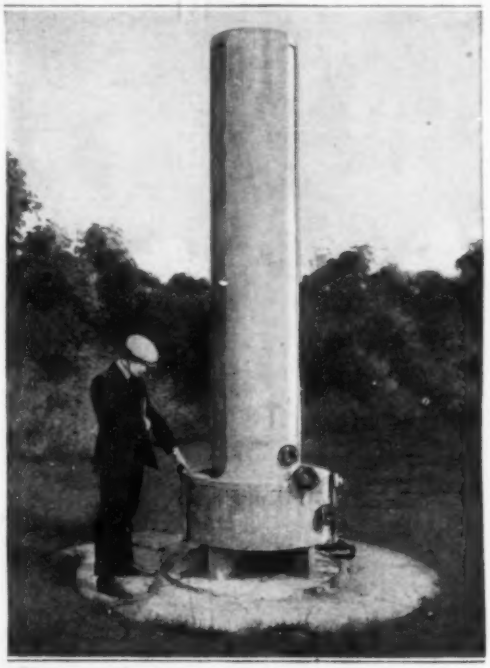
Ditcher in Operation, Showing How the Machine Throws Half the Dirt on Each Side of the Ditch When Operated in Alternate Directions: The Ditcher can be Used with Equal Effectiveness on Either Level Land or on Any Hillside Where a Team or Tractor can be Driven

HILLSIDE AND TILE DITCHER DOES WORK OF MANY MEN

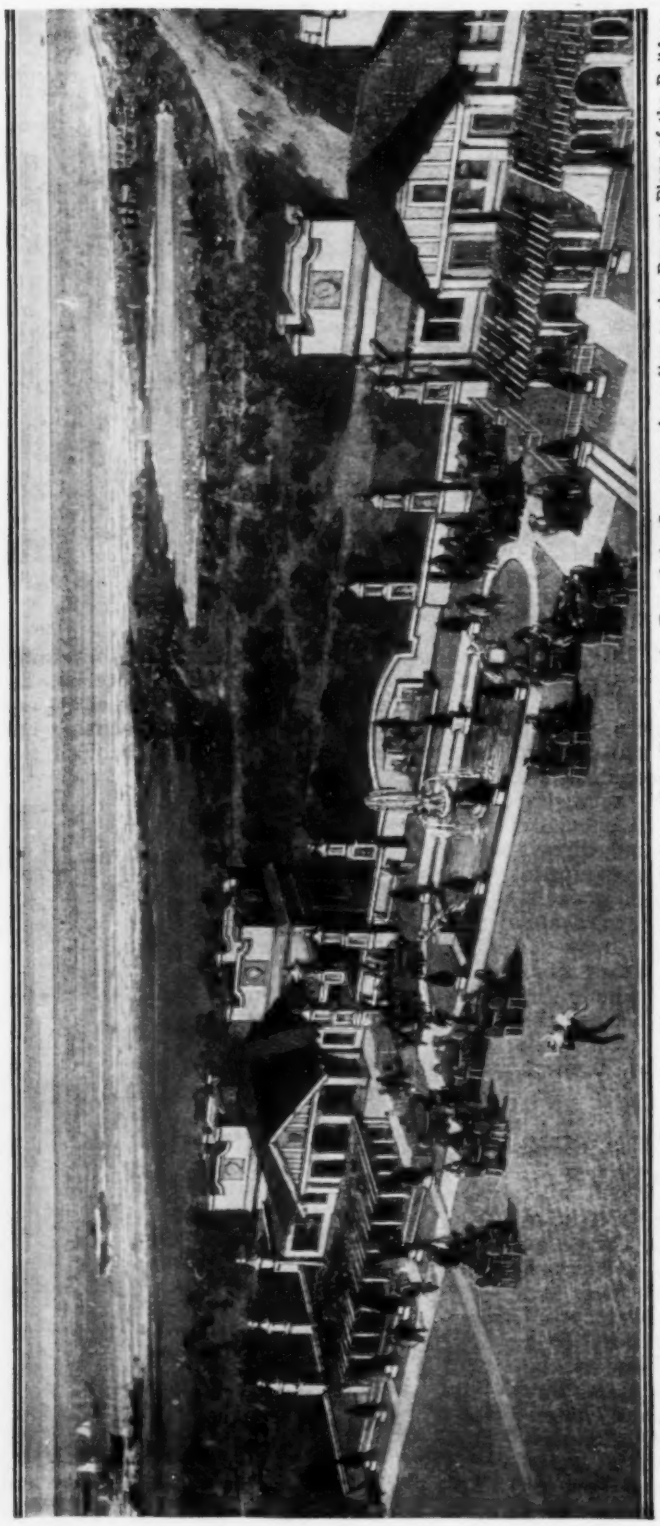
Digging ditches for the laying of tile can be rapidly accomplished with a new implement which will dig a trench 30 in. deep and any desired width, requiring only one man to operate it. A specially designed share cuts the dirt and throws it into a bull wheel which is equipped with container compartments, or pockets. These pockets carry the dirt upward and deposit it upon a horizontal throw-off table, which is revolved by gears connected with the bull wheel. The outfit has a leveling arrangement that keeps the bull wheel and cutting tool vertical at all times, regardless of the depth of the ditch or the slope of the ground.

TOWER TESTS WATERPROOFING MATERIAL FOR CONCRETE

While concrete is ordinarily thought of as a solid, impervious material, there are, in fact, many small openings in it through which water can find its way, and this makes it unsuitable where a waterproof structure is required. This has led to a search for some substance which can be mixed with the concrete to fill these tiny openings and make the concrete waterproof. One company doing this experimental work has constructed a water tower in five vertical sections, two of which are made of ordinary concrete and the other three of mixtures containing some form of waterproofing material. By filling the tower with water, the effect the different materials have in preventing the water from finding its way through the concrete can be studied.



While the Water in the Tower Seeped through the Untreated Concrete, the Waterproofed Sections Showed No Sign of Moisture on the Outer Surface



Roof of Proposed Chicago Hotel, Showing Two of the Five Bungalows Which will be Placed on the Top of the Structure, According to the Present Plans of the Builders: The Hotel will be Located Where the Occupants of the Bungalows can Have an Uninterrupted View of Lincoln Park, Lake Shore Drive, and Lake Michigan

NEW CHICAGO HOTEL WILL HAVE FIVE BUNGALOWS ON ROOF

Five bungalows, pergolas with climbing vines, sunken gardens, fountains, handball and tennis courts, will change to a scene of great activity and beauty the top of a new hotel which is to be built in Chicago during the summer of this year. These bungalows will have many special electrical features that will make them highly attractive and convenient. The unobstructed views from the windows will furnish an added charm to these ultramodern homes, commanding a vista of Lake Shore Drive with its parks and water front. It will form a noteworthy addition to the list of new Chicago hotels.

HISTORIC PINE TREE LIVED 1,200 YEARS

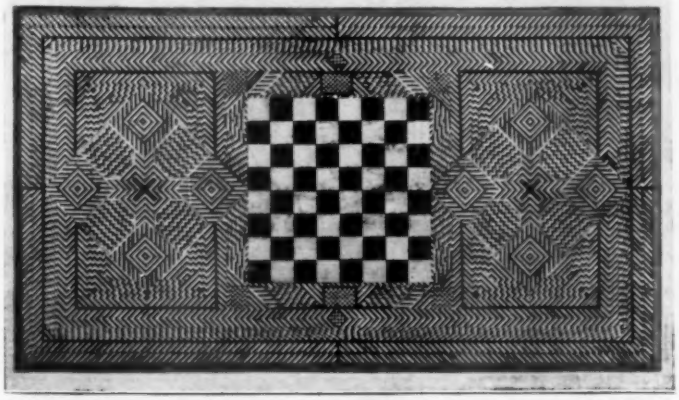
Twelve hundred years was the age of a historic old pine tree which grew on the edge of Lake Biwa, in Japan, and which recently died. Being famous in song and legend, the tree was visited by thousands of pilgrims every year, and was the center of time-honored religious ceremonies. The ancient pine was of the low spreading variety, attaining a height of only 30 ft., but having a spread of 163 ft. from east to west, and 154 ft. from north to south. Another tree, 350 years old, will succeed to the near-worship which was formerly bestowed on the dead pine.

BLOODED CATTLE IDENTIFIED BY MEANS OF NOSE PRINT

Nose prints of cattle are the latest means of identification used to determine the authenticity of any claim that an animal has a blooded pedigree. This method of identifying cattle was adopted by a University of Minnesota professor, who thus utilized a variation of the familiar Bertillon system employed by the police in cataloguing humans by finger prints. Since the inauguration of the system a few months ago, some 500 prints have been taken, and the closest examination has failed to reveal a duplication among the different breeds. Neither has there been found any change in the design as the animal grows older, so that a print attached to a registration certificate, at once identifies and prevents the substitution of inferior cattle.

THOUSANDS OF PIECES USED FOR INLAID TABLE TOP

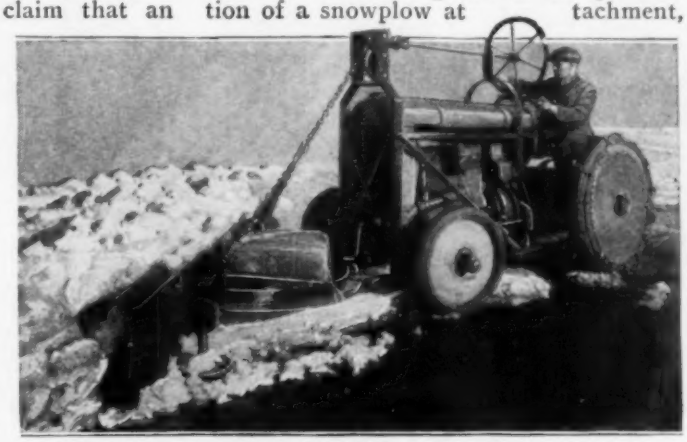
An Idaho man has recently completed an inlaid table top, on which he spent two years' time in making the 12,215 pieces in its construction. Assembling the many parts was accomplished in seven days, and the finished product includes a checkerboard, at which game the patient worker will no doubt now spend his idle hours.



Inlaid Checkerboard-Table Top, Constructed of Many Thousand Pieces by an Idaho Man: The Design Attained Is Quite Intricate and Testifies to the Patience of the Maker

COMBINED TRACTOR-SNOWPLOW CLEANS CITY STREETS

Added proof of the versatility of the modern tractor is given in the production of a snowplow attachment, which is manufactured by a Pennsylvania company. The arrangement is fastened to the front of the implement and heavy weights are placed on it, after which good results are obtained in clearing the sidewalks and streets of blockading snowdrifts.



Combined Tractor-Snowplow in Operation, Showing the Method of Attaching the Plow to the Front of the Tractor, and Also How It is Weighted

DISCOVERS NEW ATTRACTIVE NONMAGNETIC FORCE

A statement has recently been made that a German scientist has discovered a new attractive force which is nonmagnetic, and yet which causes attraction between, not only iron, but also all other metals and even minerals. It is believed that it will find immediate application in wireless telegraphy and telephony, as the energy requirement is from 300 to 500 times less than that of ordinary electromagnets for the same purpose. It is also claimed that this discovery will make possible a speed of 2,000 letters per minute in telegraphic writing.

¶ There has been installed at the University of Indiana complete equipment for the analysis of oil shales.

PROSPECTIVE RADIO CUSTOMERS LISTEN WHILE THEY SHOP

The widespread interest in wireless-telephone outfits is intensified by the methods used by a specialty shop in Brooklyn. Here the salesmen and the customers are alike supplied with receivers, and they can thus pick the messages from the air and discuss the possibilities of this new feature of modern life. In this practical manner the prospective customer is brought immediately into touch with the magic of the air, and is elated with the simplicity of it all.

The Prospective Customers are Furnished with Receivers So They can Listen to the Wireless Messages and Discuss with the Salesmen the Merits of the Different Receiving Sets being Shown

FLOTATION PROCESS ADAPTED FOR CLEANING COAL

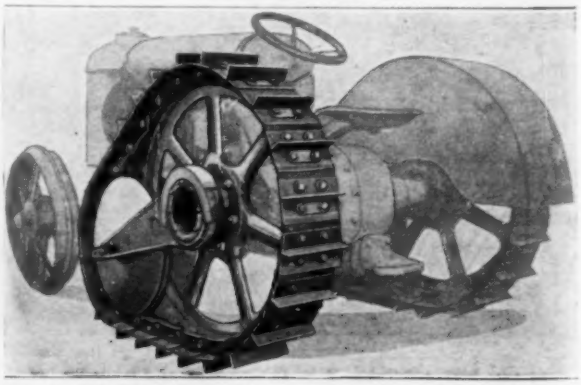
Recent investigations by the Bureau of Mines have shown that the flotation process which is so successfully used in the concentration of metallic ores can be used for cleaning many American coals of part of their ash and refuse content. Experiments on coals from the state of Washington showed that this process would eliminate much ash which was not removed by washing in jigs. The investigation did not cover the commercial phase of the problem, and the success of this method will depend on the cost as compared with the present cost of putting clean coal on the market. The problem of cleaning coal becomes more important as the present coal areas are mined out and higher-ash coals come into use.

GREAT LOSS OF NATURAL GAS CAUSED BY "WILD" WELLS

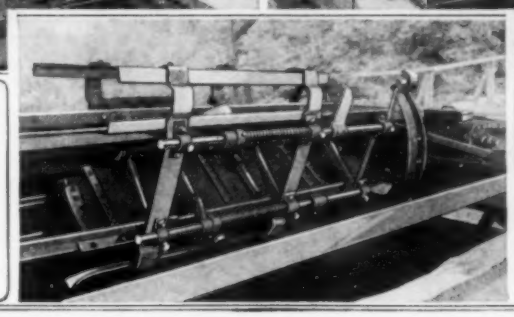
It is estimated that five "wild" gas wells in one field in Louisiana alone are allowing 30,000,000 cu. ft. of natural gas to escape daily, and steps are now being taken by the State Department of Conservation to curb this waste. The wells went wild owing to faulty drilling methods in use a few years ago, as the casing was not cemented and the gas blew out between the joints and caused a crater to form around the casing. At present some of these craters are as much as 250 to 300 ft. in diameter and are filled with mud and water. The gas escaping through this mixture gives the craters the appearance of boiling caldrons, and the roar can be heard a half mile away. In one case the derrick and drilling tools disappeared in the crater.

TRACK TREADS GIVE TRACTOR GREATER PULLING POWER

A new attachment designed to give the small tractor greater bearing area and increased pulling power, replaces the round wheels with two large sprockets. Outside of each sprocket is a cast-steel arm which projects forward and downward, carrying at its front end a smaller idler wheel. A track tread passes around the sprocket and idler wheel, giving the tractor increased bearing area.



The Large Sprockets Replace the Round Wheels, and the Track Tread Increases the Bearing Area on the Ground



Above: Automatic Car Dump, Showing an Empty Car Which has Just been Elevated to the Track by the Weight of Another Loaded Car being Dumped. In Front of the Car Is a Compression Cylinder Which Brings the Dump to Rest

Above: Automatic Car Dump, Illustrating the Manner of Dumping the Cars. The Loaded Car on the Left is being Dumped by Gravity and at the Same Time Elevates the Empty Car on the Right to the Track. Left: The Dumping Mechanism

NEWLY DESIGNED CAR DUMP WORKS AUTOMATICALLY

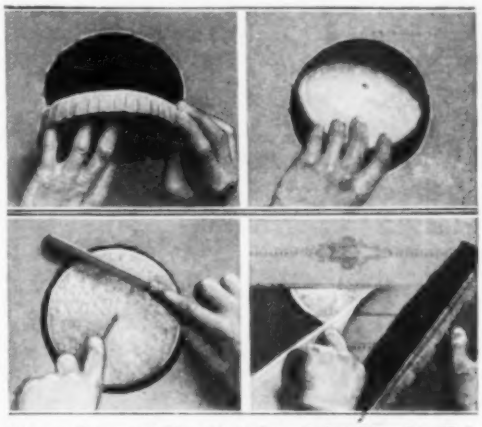
An automatic car dump with several interesting features has been constructed recently by a southern concern. In operation, a loaded car runs on the dump where a trip lever is struck, this action bringing a steel bar in front of the car wheel and stopping it in the proper place. At the same time a latch is released and the dumping mechanism operates. The loaded car is dumped on one side of the track, the weight of this bringing up an empty, previously dumped car on the opposite side. When the empty car reaches a normal position on the track, its similar steel holding bar is released, and the empty car runs off the mechanism to make way for another loaded one. It is claimed that the apparatus can be adjusted so as to allow the handling of 10 cars every minute.

COPPER-SHEATHED SHIPS MENACE IRON VESSELS

When a ship sheathed with copper is moored nearer than 200 yd. from an iron ship the action of the salt water upon the iron and copper generates an electrical current which produces electrolysis in the iron hull and destroys it. As a result of this, one of the regulations of the Navy Department is that no ship having a copper sheathing shall be placed inside of 200 yd. of an unsheathed iron ship.

FIREPROOF FLUE-HOLE STOPS INVISIBLE ON WALL PAPER

Fires in buildings have often been caused by papering over a flue hole in a wall without proper protection, and to afford this protection there is now being made an invisible fireproof flue stop. It fits within the flue hole flush with the wall, so that when papered, the surface is

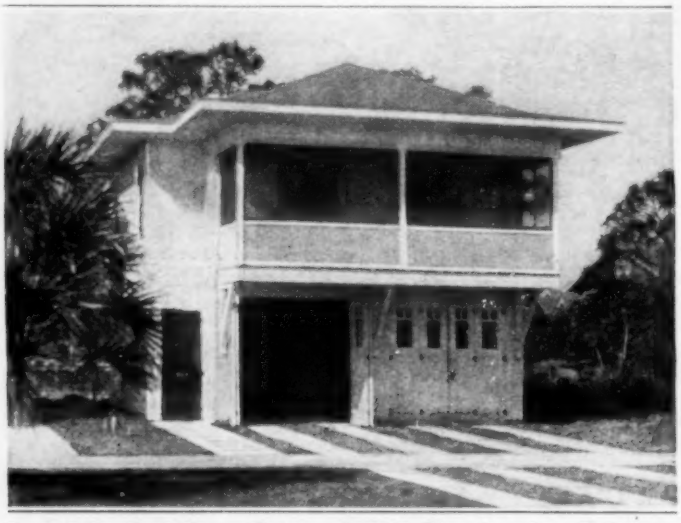


Above: Fireproof Flue-Hole Stop being Placed in Hole. Below: Left, in Place Ready for Wall Paper; Right, being Covered with Wall Paper

smooth and uniform with the rest of the wall. The metal stop is covered on the inside of the flue with a mass of fireproof material, so that there is very little possibility that a fire in the flue might ignite the wall paper.

COZY APARTMENTS PROVIDED FOR TOURING MOTORISTS

Touring motorists who follow a southern route will find in many towns, on the way to Florida, automobile camps which are equipped with unusual conveniences for the transient occupants. One type of a combined cottage-garage has been evolved with ample space for two cars below, and comfortable living quarters above for two families. Outside stairways lead up into these cozy apartments, which are provided with gas, electric lights, and running water.



Type of Combined Cottage-Garage, of Which Many have been Built along the Highways in Florida Towns, to Provide Shelter and Comfort for the Numerous Motorists Touring in the Sunny South

SPHERICAL ELECTRIC FAN THROWS AIR RADIALLY

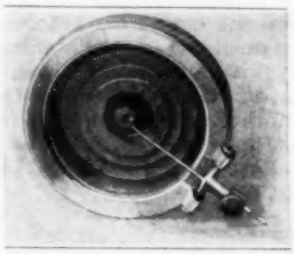
Unlike the ordinary electric fan, a fan, spherical in form, recently patented, is so designed that it throws the air radially from it in every direction. This is made possible by a construction of the fan blades so that the air is drawn in from above and below the fan, and then thrown out again in a radial stream of the width of the blades. Thus, the fan could be placed in the center of a room, and cool all parts of it equally at the level of the fan.

COMPANY WILL MANUFACTURE GERMAN AIRSHIPS HERE

An American company has recently acquired the patent and manufacturing rights for the Schuette-Lanz type of rigid airships, and two new passenger ships are to be designed for this company. Part of the material for their construction will be fabricated in Germany and part in this country, where the ships will be assembled. That much of the hazard of aerial travel will be eliminated is forecast by the announcement of the company that it will use helium gas for inflating the airships, which are to be used in commercial service between New York and Chicago. The establishment of other routes will depend on the success of the initial venture. The company expects to have the first two airships in operation by next year.

PHONOGRAPHIC SOUND BOX WITH PERFORATED DISKS

Anything that eliminates sound waves that are disturbing to those produced by the action of the record itself, in phonographic devices, will naturally improve the reproduction of instrumental and vocal music. This is said to be done in a patented phonographic sound box of the usual shape having the usual vibratory diaphragm at one end, and between that and the outlet a series of disks with registering openings, gradually decreasing in number toward the outlet, so that the sound waves are not affected by the sound box itself.



¶Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

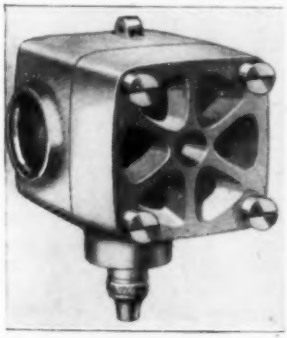
Above: In This French Airplane, of Unusual Appearance, the Lower Wing Has a Span Greater than the Upper Wing, This Design being Adopted to Equalize the Stresses in the Wings. Right: The Wings are Set Much Farther Back on the Fuselage than Is the Case with Airplanes of Conventional Design

AIRPLANE OF FRENCH DESIGN HAS UNUSUAL FEATURES

Designed originally as a bombing machine, but capable of being converted for commercial use, a new French airplane departs from the usual practice which has been followed in biplane construction. In this machine the lower wing is of greater span than the upper one, this construction being adopted in order to obtain a more uniform distribution of the stresses in the wings, and to permit the use of wing spars of the same size for both wings. Another remarkable feature is that the wings seem to be placed very far back on the fuselage as compared with other airplanes.

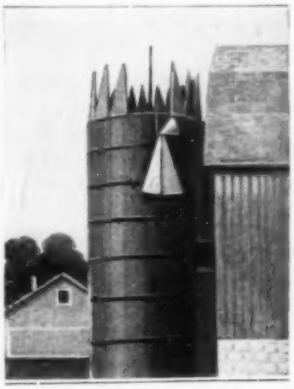
NEW DESIGN PROTECTS AUTO TAIL LAMP FROM DAMAGE

To prevent the annoyance of broken tail lamps, an English concern has designed a lamp of unusually heavy construction. The body is formed of two heavy aluminum castings, and the red glass is mounted between rubber washers held in place by a coil spring. A white light is provided on each side, one to illuminate the license plate, and one to show the road when the car is moving in reverse. The heavy casting protecting the red glass is held by four capscrews.



INGENIOUS SILO TOP MADE WITH HINGED SEGMENTS

Quite an ingenious silo top is in use on a farm in Ontario, Can. It is made of a number of triangular segments of metal-covered wood, each connected pivotally to the circular top of the silo with two strap hinges. These segments are so shaped that when turned down horizontally they overlap sufficiently to form a close-fitting weatherproof top. When raised vertically, they are surrounded with wire netting so that the contents of the silo can be piled several feet above the top, leaving the silo completely filled after settlement.



IRON FOUNDRY TO BE ERECTED ON SOUTH GEORGIA ISLAND

Although usually thought of as a barren waste of snow and ice, it is interesting to note that the equipment for a small iron foundry has been shipped to the island of South Georgia—that remote spot where Sir Ernest Shackleton was buried. It is to be used for making repair castings for the whaling station at that point or for ships which call at the island three or four times a year. This will be a great convenience for vessels, as this island is 2,000 miles from civilization.

WIRELESS MESSAGES RECEIVED ON PHONOGRAPH RECORDS

In the new wireless station at Lyons, France, two systems of receiving high-speed messages will be employed. One is the method of making a photographic record on a strip of sensitized paper, and in the other method the message is taken on a special high-speed phonograph. After the message has been recorded on the extra-heavy disk, the latter is placed in a machine running at much slower speed, and can then be transcribed by an operator. The reverse of this system can also be used in transmitting messages at speeds up to 150 words per minute.

These Phonographs Run at Much Higher Speed than the Regular Machines, and are Used in Receiving High-Speed Radio Messages Which are Recorded and Preserved on the Extra-Heavy Disks

WOODEN RAILROAD CARS HAVE LONGER LIFE THAN STEEL

Recent investigations by one of the large car-building companies have brought out the remarkable fact that wooden cars have a longer life than steel cars. The company claims that many steel cars less than 10 years old have had to be rebuilt, principally because of the corrosion of the roof, and even, in cases, of the principal beams of the car. The conclusions are contrary to the general belief that has been held by engineers in the past.

¶Flying recently near Copenhagen, Denmark, a Rumpler airplane used kerosene as fuel instead of gasoline. A special carburetor was used and the operation was entirely successful, the only noticeable difference being a decrease of 100 r.p.m. in the speed of the engine.

USE AREAS OF GRAVELLY SOIL TO STORE SURPLUS WATER

Because the rainfall of California is confined to a few months in the winter, the conservation of water for irrigation purposes during the dry season is of prime importance. Where suitable sites exist, this is accomplished by building dams to impound the surplus water, which is drawn off later as required. Where there are no suitable reservoir sites, it has been found that much of the surplus water can be conserved by spreading it over areas of gravelly soil where the streams emerge from the mountains. By this practice the underground formations hold this water until it can be recovered by pumping during the dry season. The method is now practiced on about a dozen streams in southern California, and has been found quite effective.

QUICK-CHANGE SET OF TOOLS HAS DETACHABLE BITS

Instead of the bulky set of chisels and punches, there is now available a compact set in which the different bits can be inserted as desired in a single handle. Seventeen tools are supplied in the set, and it is claimed that, as a percussion tool, each is as rigid under the hammer as the ordinary solid forged tool.

This Set of Percussion Tools Has Separate Bits Which can be Inserted in the Steel Handle. A Screwdriver Handle is Also Included

BASEMENT GARAGE FOR OFFICE-BUILDING TENANTS

No American motorist who has driven in the busy district of any big city has failed to realize the seriousness of the parking problem which the tremendous popularity of the motor car has created in recent years. Streets, laid out before motor vehicles were dreamed of, prove utterly inadequate for accommodating the cars which the public would like to park in the business district. That some solution must be found at an early date is manifest. Of peculiar interest, therefore, is the practical solution which has been worked out by the management of a new office building in Los Angeles housing thousands of persons, a large number of whom use motor cars. Not only has provision been made for tenants of the building, but for patrons of these tenants as well, thereby giving occupants of this big structure a decided advantage over those in other buildings.

The Space at the Left of This Recently Erected Los Angeles Office Building is Reserved as a Parking Space for the Cars of Clients and Patrons of Tenants of the Building. Cars may be Parked Here Free of Charge for One Hour

Entrance to the Underground Garage: Broad, Easy-Sloping Ramps Lead to the Two Floors below Ground Providing Space for Nearly 200 Cars. The Garage Is Directly under the Open Parking Space

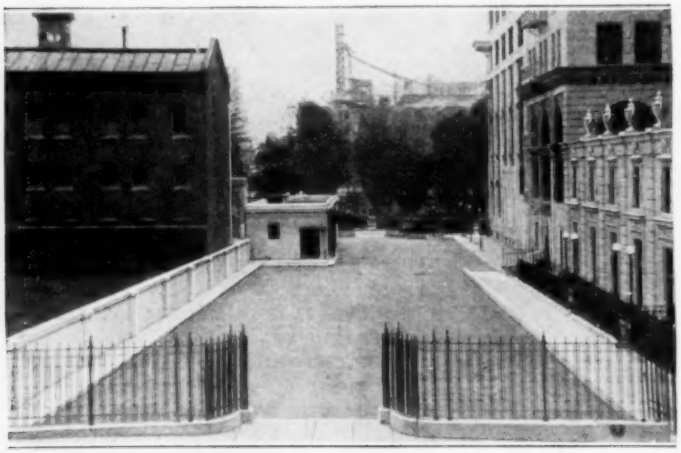
In the construction of this skyscraper an underground garage was built at the rear of the lot and adjoining the office building. This fireproof storage space accommodates nearly 200 cars and is

Underground Parking Space, Where Tenants of the Building may Store Their Cars during the Day: The Construction Is of Concrete, and Fire Protection is Afforded by a Sprinkler System. Windows Opening into a Well along One Side Furnish Part of the Illumination

reached from the street by broad ramps. Stalls in the garage rent for $20 per month. Here a moderate temperature obtains at all times, and a car and its contents are safe from exposure to the elements, and also from thieves.

The ground area immediately above the garage has been made into a fenced-in parking place for the free use of patrons of the building tenants. Outsiders who have business in the building may drive in here and park their cars. Each one is given a numbered claim check, which must receive the signature of the tenant in the building who has been called on. Countersigned thus, it is presented to the attendant in the parking place, and the car owner drives off without paying any parking fee. There is one limitation to this regulation, namely: that a person using the space longer than one hour at a time, must pay at the rate of 25 cents for each additional hour or fraction thereof.

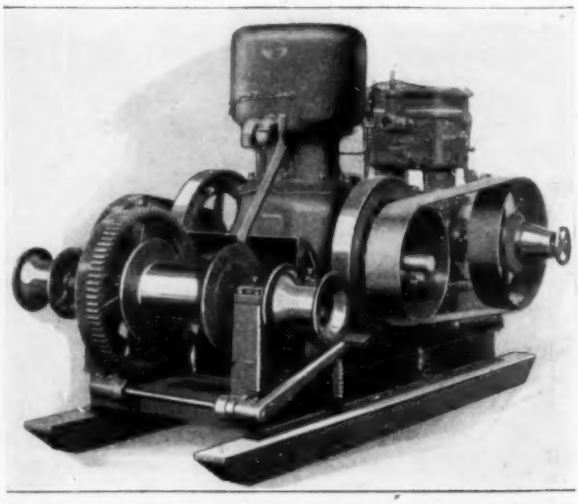
This is one of the first, if not the first, buildings in America to work out the parking problem in the manner described. Both features—the underground garage and the free parking place for tenants' patrons—are considerations which give this new building a decided advantage over older structures. In the short time since this building was completed it has been found that prospective tenants consider these arrangements for automobiles a decided advantage which is worth dollars and cents to them. There is every reason to believe that the additional investment will prove a profitable one.



The Parking Space is Protected by a Fence Which Prevents Unauthorized Persons Making Use of It Either for Storage Space or as a Passageway between Adjoining Streets

AIR COMPRESSOR AND HOIST ON ONE SUPPORT

A very compact combination of an air compressor and hoist, the whole built as a unit, is a novel installation that will be particularly useful in all kinds of steel-erection work. The power is furnished by a 15-hp. gasoline engine, which drives the hoist by gears, and the water-cooled air compressor by belting. The compressor has sufficient capacity for driving a riveting hammer, or for calking, drilling, or reaming. The hoist is equipped with a drum that holds 700 ft. of ½-in. cable, and that has a "nigger-head" at each end for handling scaffolding, etc. Both hoist and compressor are equipped with friction clutches, allowing the operation of either independently. The whole outfit is rigidly mounted on a frame made of channel steel.



Combination Power-Driven Hoist and Air Compressor: The Gasoline Engine at the Center Drives the Hoist with Gears, and the Compressor with Belting. The Whole is Rigidly Mounted on the Steel-Channel Frame

In "Exposure Parks" like This, Located in Different Parts of the World, Samples of Roofing are Laid Out and Exposed to the Weather, and Their Condition Noted after Months or Years

TESTING ROOFING MATERIALS IN "EXPOSURE PARKS"

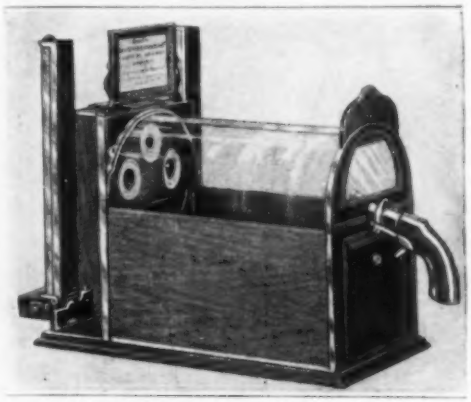
In order to test the wearing qualities of various kinds of roofing materials, one company has established what it calls "exposure parks." Here the samples of roofing are exposed to the elements and their condition noted from time to time and a record kept. These parks have been established at various places for the purpose of studying the weather-resisting qualities in different climates. In this way the manufacturer is able to advise his customers which roofing is best suited to withstand certain climatic conditions.

FLASHLIGHTS USED BY DOCTOR TO COMPLETE OPERATION

While an operation was being performed on a patient at the County Hospital in Urbana, Ohio, the electric lights were suddenly extinguished by a lineman who was repairing some wires in the vicinity. The surgeon in charge of the case, with rare presence of mind, immediately called for pocket flashlights, of which eight were obtained. With these serving for illumination, the operation was successfully completed, and announcement made that the patient would undoubtedly recover.

MINIATURE PISTOL RANGE IS VENDING MACHINE

Shooting pennies from a pistol, at targets in which are holes for bull's-eyes, is the principle of a vending machine manufactured by a Wisconsin novelty company. A penny is inserted in the spring gun, careful aim taken, and with the pulling of the trigger, the penny is shot at the target. When a bull's-eye is made, the "sharpshooter" is rewarded with a piece of candy, gum, etc., which is automatically released by the impact of the coin.



Miniature Pistol Range, Showing the Holes Which are Used as Bull's-Eyes at the Left, and the Pistol at the Right End

HARVESTING DATES REQUIRES BOTH SKILL AND AGILITY

As dates grow in large bunches at the tops of trees which reach a height of 40 to 60 ft., it is quite a feat to harvest them,

This Arab Workman Makes Use of a Rope Loop around the Trunk of the Tree to Assist Him in Climbing after the Dates When They are to be Harvested

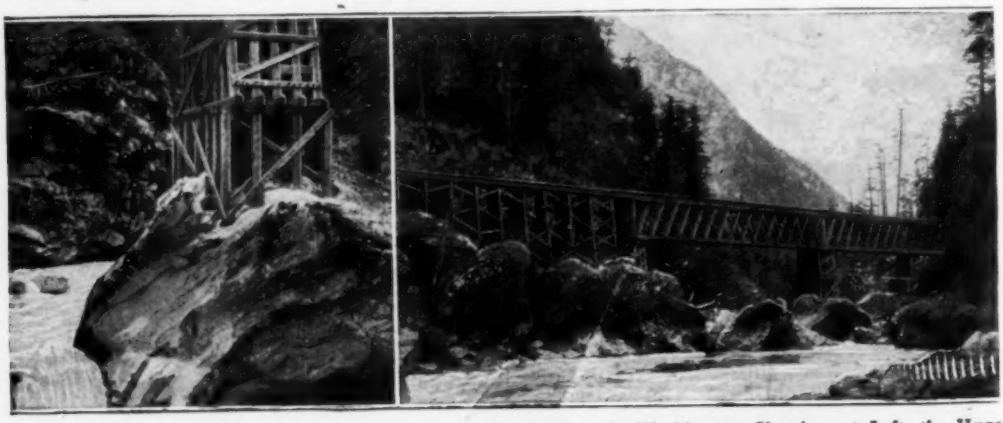
but the Arab workman becomes very adept at the task. He passes a loop of rope around the tree trunk and works his way up by leaning back against the rope and climbing with his bare feet on the knobby surface of the trunk. The bunches of dates, often weighing as much as 15 lb., are cut off with a sharp knife and lowered to the ground on a rope.

NOW SUCCEED IN PRODUCING UNBREAKABLE GLASS

According to recent reports, a Bohemian inventor, after 13 years of research, has succeeded in producing unbreakable glass. At a recent demonstration, it is said, plates and vessels of the material remained whole when thrown to the ground from a height of 12 ft. Meat was roasted on a thin glass plate over an open fire at a temperature of 750°F. Tin was melted in a glass pot, and nails were driven in a piece of hardwood, using a piece of glass for a hammer. A thin glass tumbler was heated in a stove to such a temperature that wood placed in it was charred to ashes. The glass not only stood the heat, but even remained unbroken when plunged into cold water while still in an overheated condition. The carborundum stones used for cutting ordinary glass cannot be used on the unbreakable glass, as even a diamond sometimes fails to cut it, due to its extreme toughness.

TWO-SPAN RAILWAY CROSSING OF RIVER IN WASHINGTON

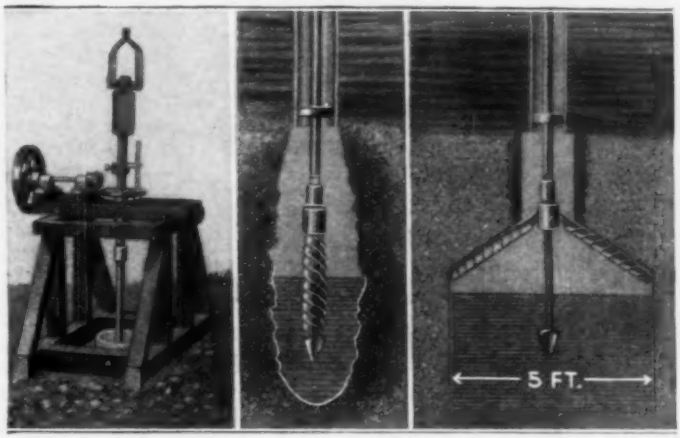
In connection with the power development of the Skagit River in Washington, as part of a 26-mile railroad, the river is crossed at Devil's Elbow by a bridge with two deck spans formed of Howe trusses, one span being 100 ft. and the other 150 ft. The pier between them was built upon a large natural bowlder, that very much simplified its construction. The curved approaches are on trestle bents. The bridge has a headway clearance of 80 ft., and has already withstood the highest water experienced in 10 years.



Two-Span Railroad Bridge, at Devil's Elbow, on the Skagit River in Washington, Showing, at Left, the Huge Natural Bowlder That Supports the Pier between the Two Spans: The Approaches, One of Which is Shown to the Right, Are Ordinary Trestle Bents, and the Spans are Formed of Howe Trusses

MACHINE FOR CLEANING OBSTRUCTED OIL WELLS

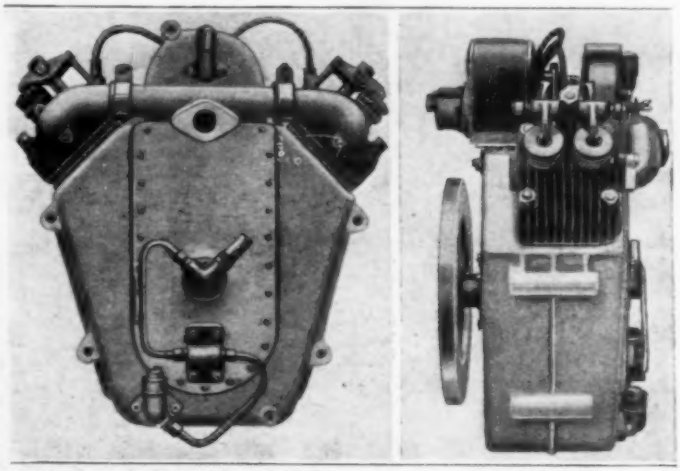
Oil wells in which the flow of oil has been obstructed by the accumulation of sand at the bottom of the well, can be cleaned by a machine that has recently been developed. To the bottom of the tubing that is used for pumping the oil is screwed a cutting bit that is about 2½ ft. long, and that is split in two longitudinally. Each half is pivoted at its upper end, so that when the tube is rotated, they swing outwardly, and as they cut away the sand, gradually assume a nearly horizontal position. When fully extended, they clean out the sand to a diameter of about 5 ft. The tube is rotated by bevel gearing in connection with a driving pulley on a suitable stand at the top of the well. This may be driven by a belt from the drilling outfit at about 90 revolutions per minute.



Left: Driving Mechanism at Top of Well for Rotating the Cutting Bit at the Bottom, as Seen at Center. When Rotated, This Opens Out to a Nearly Horizontal Position, as Seen at the Right, Cutting Sandy Obstructions Away to a Diameter of Five Feet

OIL AND AIR-COOLED MOTORS DEVELOPED IN ENGLAND

As the result of tests made during the war at the air-craft factory at Farnborough, Eng., it was demonstrated that in air-cooled internal-combustion engines as much as 40 to 47 per cent of the cooling was, under certain conditions, done by the crankcase. The result has been the design of a so-called oil-cooled engine, in which the crankcase has been greatly enlarged so as to almost completely envelop the cylinders. Single-cylinder, double-opposed and V-shaped four-cylinder motors designed on this principle have been applied to motorcycles and to automobiles with very satisfactory results. They have proved to be as quiet-running and as dependable as the best water-cooled engines, being very slightly affected by variations in atmospheric conditions. These engines are not entirely dependent upon the cooling action of the lubricating oil contained in the large crankcase, for around the latter are air passages through which a blast is circulated by fan blades on the flywheel, mounted on the crankshaft in front of the engine. The protruding cylinder heads are provided with cooling fins that are also reached by this air blast.

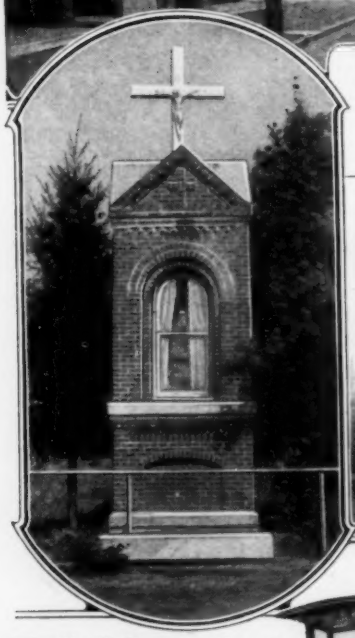


V-Shaped Four-Cylinder Oil-Cooled Motor of English Design: The Side View, at Left, Shows the Intake Side with Enlarged Crankcase for Cooling with Oil. The End View, at the Right, Shows the Overhead Valves

¶At a recent automobile show a team of three men took down a truck motor in the remarkable time of 14 minutes.

CIVIC FEATURES THAT PROMOTE THE COMFORT

Ornamental Arched Bridge between Two Buildings of the Case Technical High School at Detroit, Erected as a Memorial to the High-School Boys Who Saw Service in France: For Each High School of the City There Is a Bronze Tablet Inscribed with the Names of the School Veterans



Wayside Shrine on a Wisconsin State Trunk Highway in Portage County: Inside the Structure Is a Statue of the Virgin Mary with the Infant Jesus in Her Arms

Photo of a Booth at the Recent Wisconsin Markets Exhibit Held at Milwaukee, Being a Representation of a Box Car Ornamented on the Outside with Potatoes

Students in the Practical Mechanics Department of a Consolidated School at Goodrich, Michigan, Who Built This Bus, as Indicated by the Sign on It

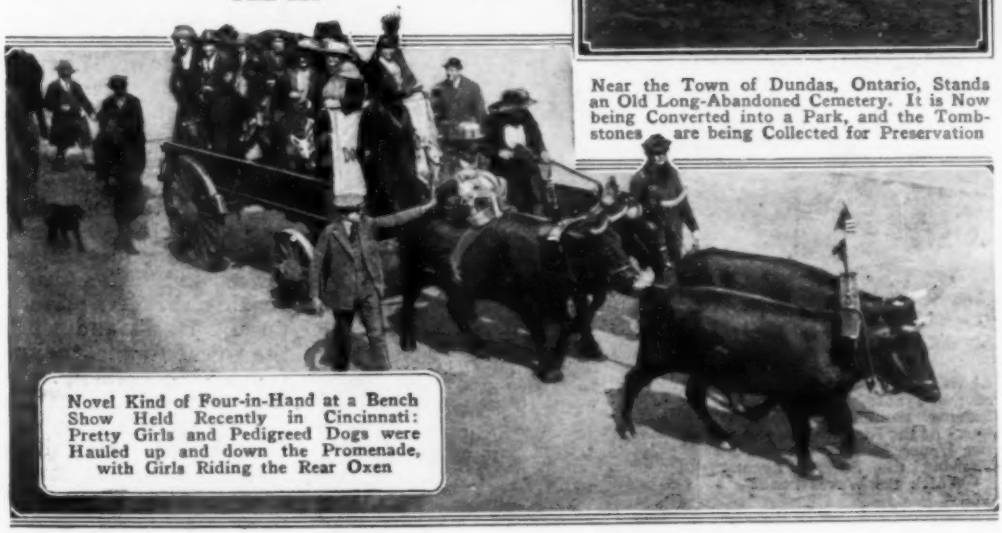
AND ENJOYMENT OF VISITORS AND RESIDENTS

Spring at the Hermitage, Tennessee, Old Home of President Andrew Jackson, Now Supplying Water for the Confederate Soldiers' Home

Trolley Poles at Stop Corners in Detroit were Formerly Striped with White Paint. Aluminum Paint is Now Used and is Found More Readily Visible at Night

Attractive Road Sign Erected in New Jersey and Located Six Miles from Cape May, on the New State Highway Leading from Atlantic City, New York, and Philadelphia: It Is 12 Feet High, 40 Feet Long, and is Illuminated at Night by Eight Powerful Lights; the Lighthouse Is More than a Picture, for It Has Two Revolving Lights, One White and the Other Red

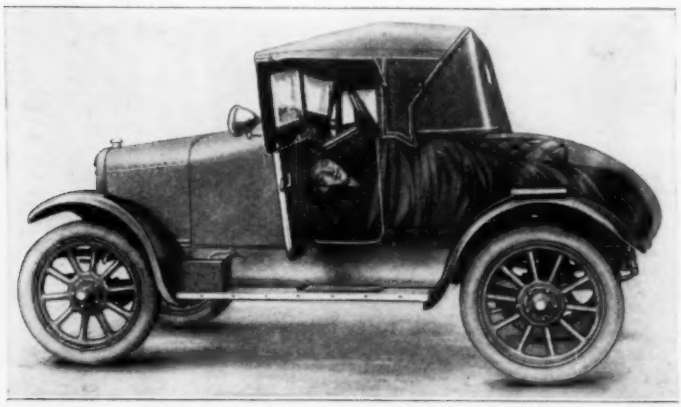
Near the Town of Dundas, Ontario, Stands an Old Long-Abandoned Cemetery. It is Now being Converted into a Park, and the Tombstones are being Collected for Preservation



Novel Kind of Four-in-Hand at a Bench Show Held Recently in Cincinnati: Pretty Girls and Pedigreed Dogs were Hauled up and down the Promenade, with Girls Riding the Rear Oxen

SPECIALLY BUILT MOTOR CAR EMPLOYED FOR SLEEPING

Employing an automobile for sleeping purposes is possible with a machine now found on the English market. The car, a small runabout or roadster model, has a removable seat and back. These are so arranged that the occupant lies in a comfortable position, his head near the dashboard and feet extending to the rear of the vehicle, thus allowing him to obtain rest while touring.



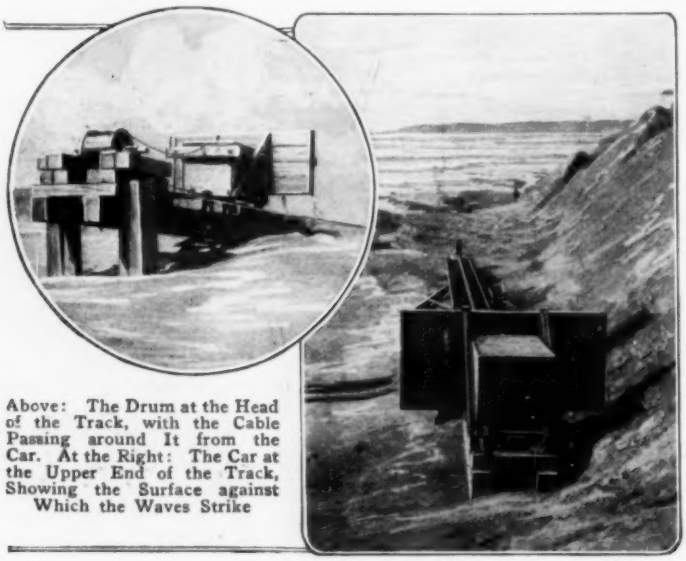
Specially Built Motor Car, Showing How It was Designed for Quick Conversion into a Sleeping Compartment When being Used for Touring Purposes

EXPERIMENTAL PURIFICATION OF CANNING WASTES

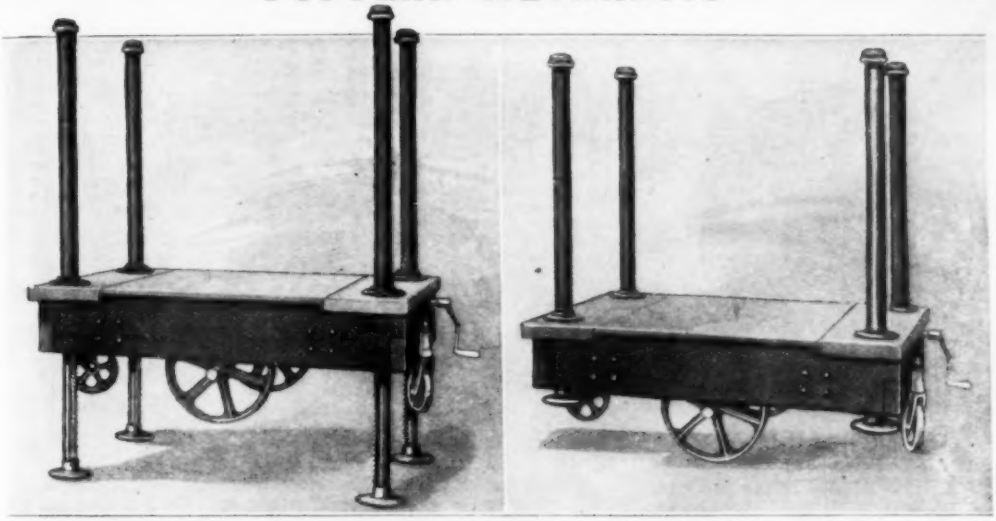
Tests made by the U. S. Public Health Service have proved that the waste liquids of tomato-canning factories, and by inference, of factories packing any vegetable or fruit, can be purified and may be discharged with impunity into relatively small bodies of water. The wastes treated, consisting of liquids used in washing floors, utensils, and canning apparatus, from which about 85 per cent of the solid matter held in suspension had been removed, were pumped into settling tanks, and the citric acid of the tomatoes was largely converted into lactic acid. The separated solids were disposed of in shallow beds of sand and cinders. The liquid from the settling tanks was filtered first through a bed of coarse cinders and then through sand, after which it was found that fish could live in it for six weeks. There were no objectionable odors in connection with this work.

NOVEL ATTEMPT TO UTILIZE ENERGY OF WAVES

A new attempt to utilize the energy generated by wave action is interesting because of its novelty. A track, 75 ft. long, set at an angle of about 30° with the ocean surface, has been constructed at Ocean Beach, Calif. A weighted car runs on the track, but cannot leave it. The front of the car presents a broad surface at right angles to the track. A cable, attached to each end of the car, runs over a drum at the upper end of the track, and over a submerged pulley at the lower end. The waves striking the car, drive it up the track, and when the waves recede, the car returns by gravity. In this manner the car is given a reciprocating motion, which, transmitted through the drum, can be used to drive a pump or other machinery.



Above: The Drum at the Head of the Track, with the Cable Passing around It from the Car. At the Right: The Car at the Upper End of the Track, Showing the Surface against Which the Waves Strike



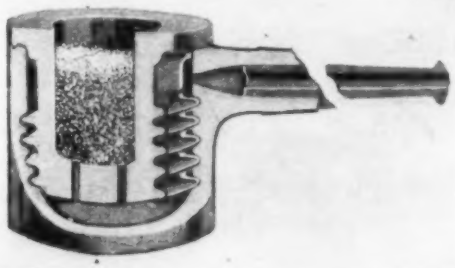
Left: By Turning the Crank at the End of the Truck, a Worm Gear and Pinion Cause the Legs to Extend, Raising the Truck Body High Enough So It may be Used as a Workbench. Right: When Used as a Truck the Extension Legs are Lifted Clear of the Ground

TWO-PURPOSE FACTORY TRUCK HAS FOUR LIFTING LEGS

A factory truck with a capacity up to 2,000 lb. has been devised along rather unusual lines. At each corner it is equipped with an extension leg, and by turning a handle, the truck body can be raised to form a workbench or to assist in transferring the load to an auto truck or car. The lifting mechanism is self-locking at any point.

SMOKE TAKES SPIRAL COURSE IN TWO-PIECE PIPE BOWL

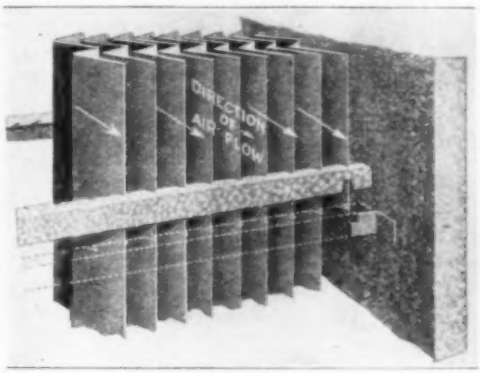
With the object of producing a dry, clean smoke, a new pipe has been devised which consists of an inner bowl screwed into an outer shell. The threads are so formed that the smoke follows a spiral path in passing from the bowl to the stem. The bowl may be removed for cleaning.



The Smoke is Drawn Down into the Bottom Chamber and Then Up along the Spiral Thread to the Stem

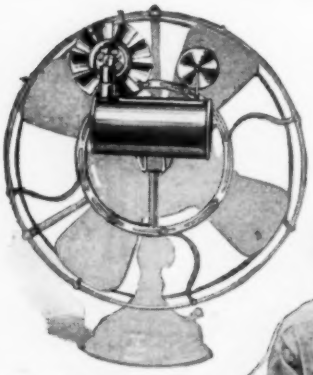
AIR-MOISTURE ELIMINATORS OF DEMOUNTABLE TYPE

Eliminator plates, used for the elimination of moisture in the process of washing air, are now being manufactured so that they may be installed or taken down with a minimum expenditure of labor. Angle-iron frames, provided with slots in which the plates are placed and rigidly held, are slipped into a bracket that is riveted to the side of the air-washer casing. This method of construction supplies an effective means for cleaning, painting, or making repairs, as the entire set of plates, or any unit thereof, can be removed or replaced with ease and facility, thereby reducing the possibility of corrosion, and extending the life of the plates.



Eliminator Plates of Air-Washing Process Shown Placed in the Angle-Iron Frames, Which are Slipped into Brackets Riveted to Air-Washer Casing

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

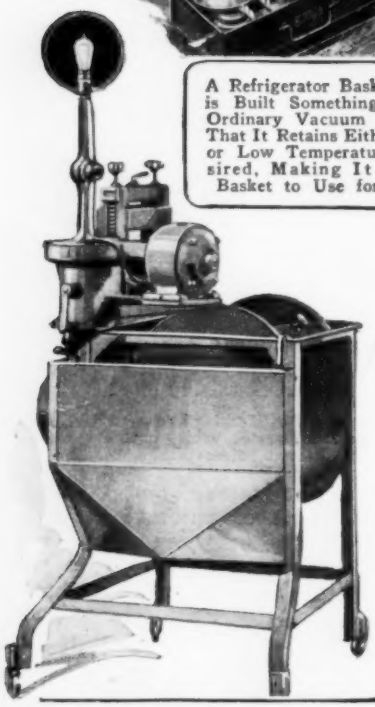


An Air-Purifying and Deodorizing Attachment for Electric Fans Which Circulates an Agreeably Perfumed Germicide

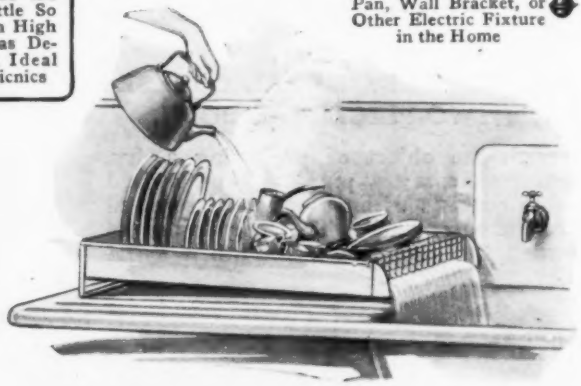
This Dish Scraper Has a Rubber Blade Which Easily and Quickly Scrapes Dishes and Utensils of Any Size and Shape, Thus Saving Water, Soap, and Towels

A Refrigerator Basket Which is Built Something like the Ordinary Vacuum Bottle So That It Retains Either a High or Low Temperature as Desired, Making It an Ideal Basket to Use for Picnics

Fixture Switch That can be Attached to Any Canopy, Ceiling Pan, Wall Bracket, or Other Electric Fixture in the Home



An Electric Washing Machine Which Has a Light Mounted on a Vertical Arm to Illuminate the Dark Places of the Laundry: The Lamp is So Wired That It Is Independent of the Motor



This Dish Drainer Runs the Water off the Dishes Directly into the Sink. It is Elevated at one End, While the Other Hangs over the Edge of the Sink

A Cuff Holder That Enables the Wearer to Adjust the Cuff on the Forearm or above the Elbow, Making It Possible to Wash the Hands or Perform Other Work without Soiling the Cuffs

Anyone wishing further information on devices described in the editorial pages can

INTENDED FOR THE HOME AND ITS MEMBERS

This Combination Can Opener and Bottle-Cap Lifter Has an Aluminum Nonrusting Handle and a Crucible-Steel Cutting Edge

An Electric Washer Pump Which Empties Water from the Washing into the Sink or Tub at a Rate of Eight Gallons a Minute

The Use of This Small Heater, Which Burns Alcohol, Keeps a Room Comfortable on Chilly Days

A Vanity Pillow That Opens like a Bag and Contains a Mirror, Powder, Rouge, and Other Make-Up Necessities

A New Rotary Fruit and Vegetable Press That Saves Much Time in Crushing Fruit for Ices, or Vegetables for Soup

This Sanitary Dish Washer will Automatically Soap, Wash, Rinse, and Sterilize the Dishes, Glasses, and Silverware

Combination Knife and Tape Measure Which Has a Blade of Good Steel and an 18-Inch Tape Measure

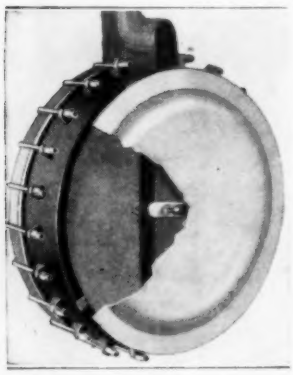
Bathroom Toilet Cabinet with Storage Compartments for All Necessary Toilet Articles, a Dressing-Table Top, Bevel-Glass Mirror, Clean-Towel Drawer, and a Hamper for Soiled Linen

A Swing for the Baby, Which Folds Compactly and Is Easily Carried When Going on an Outing

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

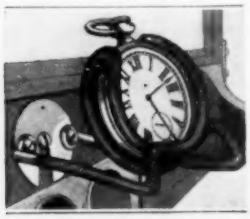
BANJO RESONATOR AMPLIFIES ITS VOLUME SNAPPILY

A resonator, or sound amplifier, that can be attached to any banjo, greatly increases its volume and gives a sharp, snappy quality to the tone. It consists of a polished brass cover that fits on the back of the banjo flush with its outside rim. On the crossbar of the instrument, at its center, there is clamped a threaded tube, one end of which is soldered to the center of the brass cover. The resonator is made to fit 10, 11, or 12-in. instruments, and can be attached or removed instantly without injuring the instrument in any way.



WATCH CARRIER FOR AUTOS IS HANDY ACCESSORY

Autoists making long trips in a machine that has no clock permanently installed in it, can have the advantage of this convenience by the use of a watch carrier. This accessory consists of linen-covered steel wire, which is bent in such a manner as to securely hold a 16 or 18-size timepiece. Fastened to the dashboard, the watch is visible from any seat.

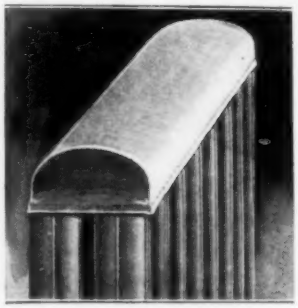


OIL DEVELOPMENT PREDICTED FOR SOUTH AMERICA

Predicting a great oil development in South America, Dr. David White, of the U. S. Geological Survey, has stated that that continent is richer in petroleum resources, in comparison with the area, than any other, with the possible exception of North America. This expert also claims that 13,000,000,000 of the estimated 60,000,000,000 bbl. of the world's total supply, lies under the surface there, waiting for some one to place it on the market. Geologists have evidence of high-grade petroleum deposits, and in numerous regions the conditions are such as to warrant the belief that oil would be found by exploration and drilling.

CLOTH COVERS ON RADIATORS KEEP ROOM WALLS CLEAN

As a cover for steam radiators a very simple device has been found to protect the walls and ceiling of a room from being disfigured by the dust that always rises with the heated air from any radiator. The cover is made of coarse cloth, preferably of a dark-gray color, cut in one piece to fit exactly the top of the radiator, with two end and sidepieces, a few inches wide, all neatly sewn together. The cover is removed from the radiator several times a week, and is cleaned by shaking.



NEW CALIPER HAS SCRIBER FOR MARKING CENTERS

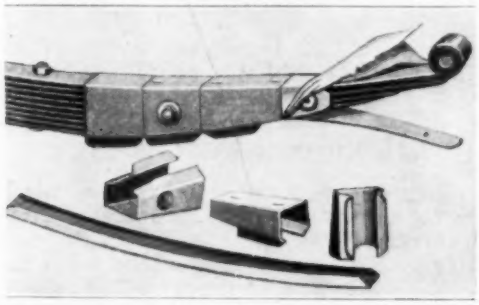
On an ordinary outside caliper there has been pivotally connected to its legs, and on its central axis, a short tubular sleeve, in such a manner that however its legs are opened, the sleeve remains always on this central line. Sliding through this sleeve, and extending through the pivoted apex of the caliper, is a rod that at its other end has a hardened point like a scriber. A helical spring on this rod tends to hold the jaws of the caliper tight on any piece of work that it straddles, and a little pressure on top of the rod with the hand that is adjusting the caliper will cause the point on the other end of the rod to mark or scribe the exact center of the piece of work.

SELF-GOVERNMENT PRACTICED BY DEPARTMENT STORE

One of the large department stores of Boston has successfully tried a form of self-government patterned much on the order of the U. S. government. Employes elect members of the House by ballot. Department executives form the Senate. Four high executives form the cabinet, and the president of the company is the chief executive. Under this plan, the employes practically regulate their own working conditions, and the system has led to a valuable exchange of ideas, the founding of welfare organizations, and a substantial increase in the store's business.

PLIANT-METAL SPRING COVER FOR AUTOS AND TRUCKS

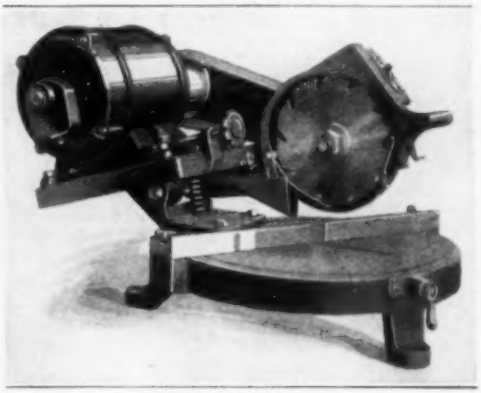
To keep all dirt, sand, and moisture from automobile and truck springs, and to maintain them in a constant state of perfect lubrication, a metal cover is being manufactured that can be made to fit any spring, and can be enameled to match the color of the car. The cover is a continuous, flexible-metal sleeve, that yields to any deflection of the spring, and yet remains at all times grease-tight. It is filled with graphite grease, which is forced in through a fitting provided for that purpose, and which gets between the leaves of the spring.



Three Sections of Flexible-Metal Spring Cover, Shown Assembled Above and Disassembled Below: When Completed, Similar Sections Extend the Whole Length of the Spring

PORTABLE BENCH SAW CUTS MITERS AT ANY ANGLE

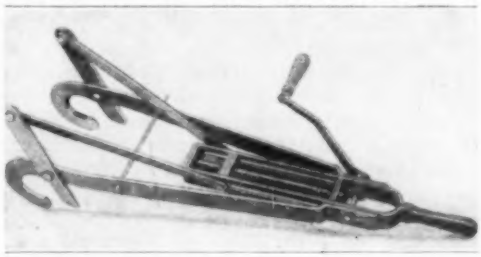
In a new portable bench saw, a motor and a circular saw are mounted on a frame that swivels in either direction, permitting both right-angled and oblique cuts to be made. The machine is provided with a revolving table that is graduated on its outer edge. This table fits into, and revolves in, a circular base, on the side of which is a locking device. Above the table is a bar used as a gauge for holding the work, so that after the table is revolved and locked at the desired angle, any bevel or miter can be cut quickly and accurately. On the housing of the saw is a control handle, and near it a simple switch, so that a finger of the same hand that depresses the saw into the work, starts and stops the motor with the switch.



Portable Bench Saw for Cutting Miters on Any Kind of Wooden Fittings: The Handle in Front of the Base Is for Locking the Table at Any Required Angle

IMPROVED DEHORNER REMOVES BOTH HORNS AT ONCE

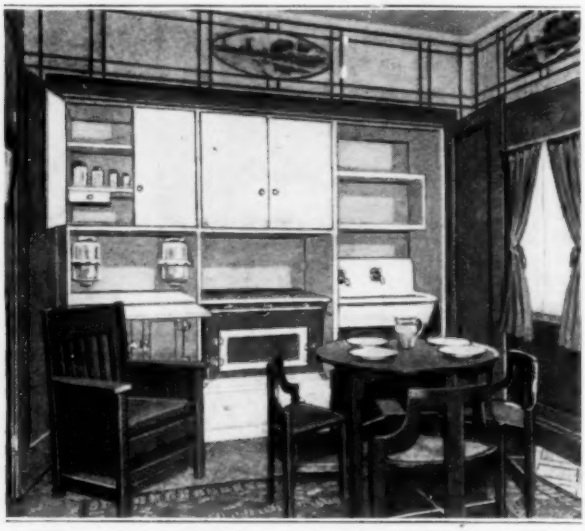
For dehorning cows or calves, an instrument that, it is claimed, will remove both horns in 30 seconds, is certainly an improvement over old methods of sawing still in common practice. The dehorner comprises stationary and pivoted cutting blades which engage the horns, and by the operation of a crank handle these cutting blades are moved so that the horns are cut from the animal. There are two pairs of cutting blades, which are adjustable laterally to fit any pair of horns, both of which are thus removed simultaneously.



Two Views of Dehorner That Removes Both Horns at Once from an Animal

STEEL KITCHENS PROVE AID IN CONSERVING SPACE

Conservation of space is an important problem in the construction of the modern apartment building, and a kitchen consisting of two steel cabinets, 18 in. deep, 30 in. wide, and 82 in. high, has greatly aided in this effort. One cabinet contains a three-burner gas range having a broiler burner in a large oven, and the other houses a refrigerator of 50-lb. ice capacity and possesses spacious food compartments. Numerous drawers for cutlery, pans, etc., and shelves for dishes are provided, in addition to a standard 18 by 24-in. sink with special drain shelves, which is mounted beside the cabinets. When not in use, the kitchen can be shut off from the remainder of the living quarters by large wooden doors which match the interior trimming of the room.



Steel Kitchen with Refrigerator and Shelves at the Left, Three-Burner Gas Range in the Center, and Sink at the Right

EXCAVATIONS WILL BE MADE AT RUINS OF COLOPHON

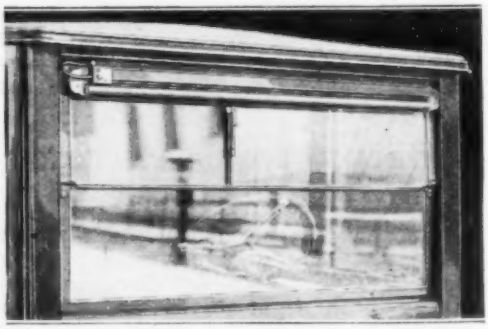
A particularly promising site for excavations is that of the ancient city of Colophon, in Asia Minor, that flourished about 800 B. C. Permission has been granted by the Greek government to the American school of classical study at Athens to make excavations there, and under the permit the school will do this work in collaboration with the Fogg Museum of Fine Arts of Harvard University. Colophon was one of the twelve cities of ancient Ionia.

ALCOHOL AS A BY-PRODUCT OF A MEXICAN PLANT

In Mexico, a plant known as the maguey, which is a species of the agave, or American aloe, has for a long time been utilized for the manufacture of sisal hemp. Up to the present the sap contained in the plant has been wasted, but it is now contemplated to utilize this also for the production of industrial alcohol. The plant grows very extensively in many parts of Mexico, and it is calculated that without any further cultivation, there could now be produced annually many million gallons of alcohol. The promoters of the enterprise in Mexico base their estimate of the value of the industry to Mexico on the fact that the alcohol would be a valuable fuel for internal-combustion engines, especially of the gasoline type, which fuel it could easily replace at a very great reduction in price. The intention is to utilize the fiber of the plant for making sisal hemp, leaving a residue suitable for making paper, and thus the alcohol would be entirely a by-product of inexhaustible quantities that could be sold at a very low price.

UPPER HALF OF WINDSHIELD WIPED BY NEW CLEANER

Realizing that the usual type of windshield cleaner gives the automobile driver a very limited range of vision, a new cleaner has been devised which wipes the entire upper half of the windshield glass. The wiper arm is attached to a piston in a tube which extends across the full width of the top. This tube is connected

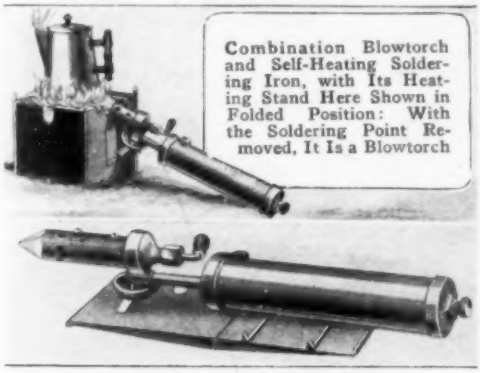


This Wiper Cleans the Entire Upper Half of the Windshield and is Actuated by the Suction in the Intake Manifold of the Engine

to the intake manifold of the engine, and the vacuum at this point causes the piston to move in the tube. An ingenious system of valves causes the suction to be applied to the other side of the piston when it reaches the end of its stroke.

COMBINED SOLDERING IRON AND BLOWTORCH

A combination gasoline blowtorch and self-heating soldering iron which can be used as the latter when combined, or as the former when the soldering point is removed from it, is now on the market. The part of the device that forms the handle, when used as a soldering iron, is a barrel 1½ in. in diameter, and about 10 in. long, in which is the air pump and the gasoline container, and at the end of this is the blowtorch nozzle, with a removable soldering point, against which all the



Combination Blowtorch and Self-Heating Soldering Iron, with Its Heating Stand Here Shown in Folded Position: With the Soldering Point Removed, It Is a Blowtorch

flame in the torch is directed. A heavy cotton wick assures the flow of gasoline regardless of the position in which the torch is held. A folding heating stand is supplied with the torch.

"NO MAN'S LAND" AT RHEIMS CONTAINS 600 HOUSES

"No man's land" in the outskirts of Rheims, France, has had 600 houses constructed on it during the last year, in which 4,000 persons will live. The new buildings are erected between the forts of Nogent-l'Abesse and Berru, and are equipped with every modern improvement, including nurseries for infants and playgrounds for children.

¶ It is announced that the recently completed government railroad from Seward to Fairbanks, Alaska, has been officially named "The Alaska Railroad."

CONVENIENT DESK MEMO PAD KEEPS PAPER CLEAN

One of the latest devices in office equipment is a memorandum pad for the desk which is so built that the paper, while

This Convenient Desk Accessory Contains a Roll of Memorandum Paper Which is Protected from Dirt but Always Ready for Use

readily available, is always kept clean. A roll of paper is carried in the holder, and a slight pressure on the top of the case enables the user to grasp the end of the strip, which can be drawn out and detached with one hand.

ARTIFICIAL "NOSE" PLACED IN NECK OF HORSE

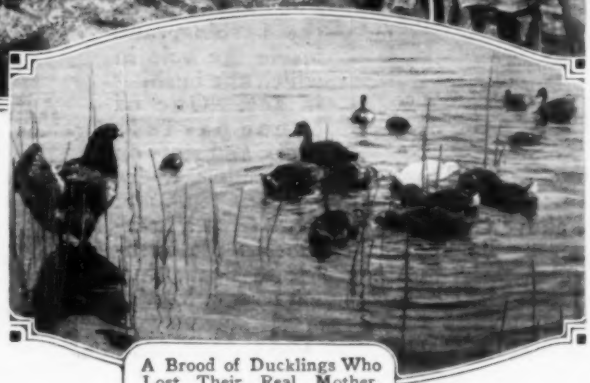
Deprived of natural breathing facilities through an accident several years ago, a horse in Cincinnati, Ohio, has been provided with an artificial "nose." The apparatus consists of a silver tube, which is inserted in the neck of the animal, connecting with the windpipe. A fine-meshed screen in the tube prevents the entrance of any foreign matter that might shut off the air supply, and the horse has been driven as usual since the operation, with no apparent ill effects, although its daily appearance on the city streets never fails to arouse interested comment.

Equally Entertaining and Instructive, the Most Popular Scientific Instrument of the Day Is the Radiophone, the Interest in Which is Spreading So Rapidly That It Looks as If before Long No Well-Furnished Home will be Thought Complete without One. In Many Schools There Are Now Regular Classes in Radio Instruction Such as the One Shown Above, Which Is at the Lane Technical High School, in Chicago. The Instructor Has No Difficulty in Holding the Attention of the Students

Snow in Southern California Transported from the Mountain Tops and Dumped onto a Green Lawn for the Kiddies to Enjoy Snowballing. Right: A Rabbit up a Tree, Although Rabbits cannot Climb. The Little Hill behind the Tree Was So Close to It That Bunnie could Hop Easily from One to the Other

Village of Plymouth Modeled by Sixth-Grade Pupils: Houses are Made of Twigs, with Strips of Bark for Roofs, All in a Trayful of Sand

A Real Live Alice in Wonderland, For It Is Alice Hastings being Carried by Natives through the Wilds of the Belgian Congo: She Was the Youngest Member—Only Six Years Old—of a Party of Americans Who were There Hunting Gorillas



A Brood of Ducklings Who Lost Their Real Mother, and Now Have as Foster-mother a Hen Whose Only Trouble Is How to Take Care of Her Brood without Getting Wet

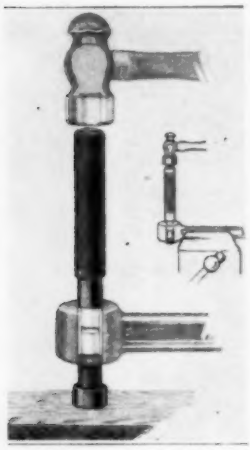
An Overland Canoe Makes the Kiddie Driver Independent of the Water and Free from Its Dangers. It Is Self-Propelling, and will Carry 200 Pounds

Slingshot Made of Polished Aluminum—Very Light and Smooth, Therefore Easier to Handle Than the Old Ones of This Type

Story of the Landing of the Pilgrims at Plymouth Modeled in Sand by Fifth-Grade Pupils of the Cutler School of Somerville, Massachusetts

BEARING BUSHINGS RENEWED WITHOUT DISPLACEMENT

In order to eliminate the necessity of replacing the bushing when a bearing becomes loose from wear, a swedging tool has been devised that will reduce the bore of a bushing as the result of a few strokes from a hammer. The tool consists of two parts, each of which has an end small enough to fit inside the bushing, with a shoulder that fits over the end of the bushing, and inside the hole in which the bushing is set. One of these parts is short, and rests on any support below the bushing under treatment, and the other part is long, and is above the bushing. Blows from a hammer on its upper end shorten the bushing slightly, and cause it to swell, thus reducing the bore as much as required.



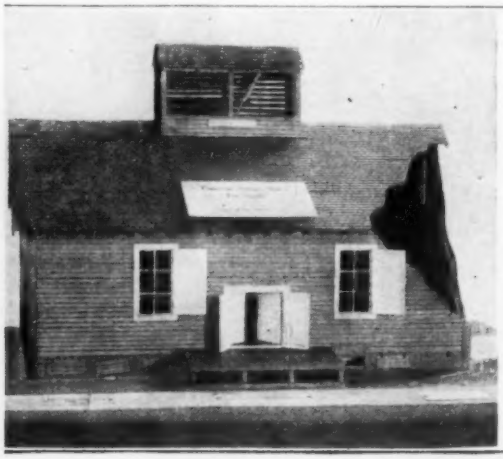
STORAGE HOUSE FOR APPLES HAS GOOD VENTILATION

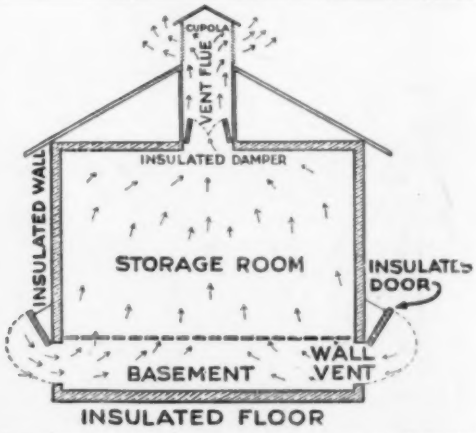
Apples or other perishable commodities can be kept for a long period of time without danger of decay, in a storage house which was especially designed for the apple industry of the Northwest. The walls, floor, and ceiling of the building are insulated with sawdust, mill shavings, commercial cork, or mineral wool. The doors are also insulated, while the windows have two thicknesses of glass, and have insulated shutters. Every 10 ft. along the bottom of the sides and ends, are 18 by 24-in. openings, or vents, and inside the structure is a false floor with the boards laid 1½ in. apart and built just above the openings around the base. Topping the whole is a cupola in which are numerous vents, and which has a damper placed where it joins the ceiling. At night, in warm weather, all the vents are opened, and the warm air inside the house escapes through the cupola, thus providing free circulation of cool air, which aids in preserving the fruit.

ARMREST EASILY ATTACHED ON DOOR OF SMALL CAR

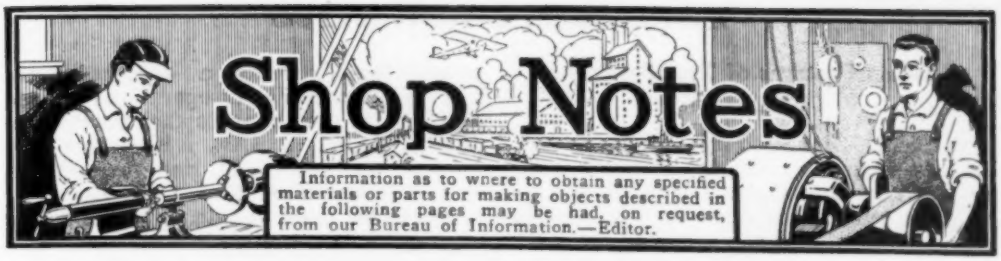
Automobile owners now may avail themselves of an armrest which can easily be attached to the door of the machine, thus adding comfort to the trip. The appliance has two U-shaped brackets that fit over the door top near the wheel, and the rest is padded and may be covered to match the interior of the car.

¶When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.





Left: Apple-Storage House, Showing Insulated Doors, Shutters, and Cross Section of Walls. In the Base of the Building are Seen Numerous Vents. Right: Ventilation Plan of House, Showing How Air is Circulated



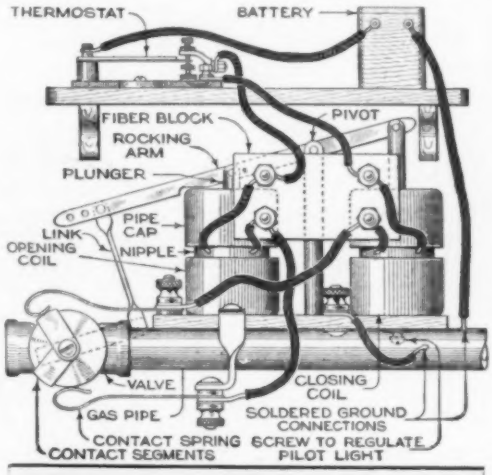
Supply of Gas Automatically Controlled

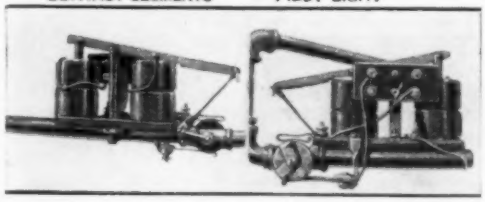
By CURTIS RALSTON

THE gas controller shown is a device which, owing to its cheapness and simplicity, may be used for many purposes where it is necessary to regulate the flow of natural or artificial gas used for heating.

The controller, or regulator, working in connection with an ordinary expansion thermostat, opens the gas valve whenever the temperature falls to a predetermined point, and when the temperature has risen to the desired maximum the valve is automatically closed, except for a sufficient flow of gas to supply a "pilot" light. Since the power for opening and closing the valve is supplied by one or two dry cells, it is of great importance to cut off the flow of electric current as soon as the work is done and thus prevent waste of power; how this is done is clearly shown.

The thermostat may be made at home, if desired, but the purchased article will generally be found more satisfactory. When the thermostat gets warm, its expanding member curves downward, closing a circuit through the electromagnetic solenoid at the right, which then pulls down into it the iron rod forming the core, thus closing the gas valve. As the valve completes its rotation, it breaks the circuit through the closing coil and closes another circuit through the opening coil at the left, thus preparing the valve-opening coil to work as soon as its thermostatic contact closes. The whole operation takes place at a single "click" and occupies but the fraction of a second, and the amount of energy taken from the battery is so small that a single pair of cells will last for a long time. The electromagnets are of the "shell" type, each being covered by two iron pipe caps, which are connected by a nipple. The coils are wound around a hollow core of iron pipe which has a diameter sufficient to accommodate the solid movable cores. A hole is drilled through the center of the upper pipe caps to permit insertion of the cores. Bell wire is used for the coil windings, and the greater the number of turns the greater will be the "pull" exerted on the cores; also, more current will be required to operate the device. The magnetic circuit is thus mostly all iron, which produces a very powerful type of magnet. When the controller is set up, the first adjustment to make is for the flow of gas for the pilot burner, and this is done by a screw in the bottom of the valve-closing magnet. The two thin-brass contact springs, which make contact with the segments on the fiber or hard-rubber valve disk, should then be adjusted to give a positive break, late enough so that rotation of the valve is complete.





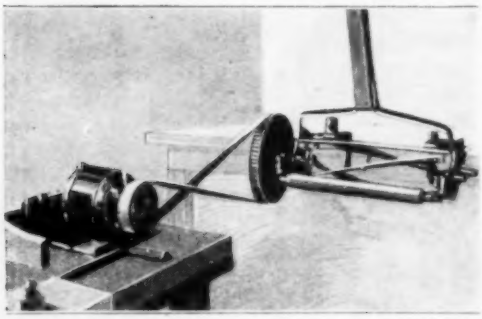
Above: Constructional Features and System of Wiring for Connecting the Thermostat, Battery, and Electromagnets to the Levers. Below: Photographs of the Regulator, Giving Front and Rear Views of the Device

Certain Features of Tree Surgery Patented

While it is no infringement of an inventor's right for a publisher to tell how a patented article is made, it is, of course, an infringement for any one actually to make the article for the use of himself, or others, without permit from the owner of the patent. For that reason this magazine never publishes in this department a description of how to make anything it knows to be patented. On page 283 of the February, 1922, issue, we published an article entitled, "How to Save Decayed Trees," being a description of how to perform divers operations of tree surgery. It now appears that patent No. 890,868, issued in 1908, and patent No. 958,478, issued in 1910, and now owned by the Davey Tree Expert Company, of Kent, Ohio, cover particularly the filling of a cavity in a tree with concrete in sections, and the provision of a water channel at the edge of the cavity, as described in our article. Our readers are hereby cautioned *not to use* the above features of the described process without having first secured consent or license from the Davey Tree Expert Company, Kent, Ohio.

Sharpening the Lawn Mower

The photograph illustrates a method by which lawn mowers are easily sharpened in a few minutes. The apparatus required includes an electric motor; a large wooden pulley to fit the end of the cutter shaft; two clamps, a belt, and some oil and emery powder.



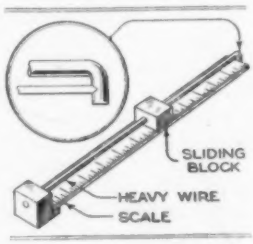
By Revolving the Cutter Reel of a Dull Lawn Mower in a Direction Opposite to That in Which It Runs When Mowing the Lawn, and Feeding an Abrasive Compound onto the Blades, They are Rapidly Given a Keen Cutting Edge

The mower is clamped rigidly by the crossbar, the wheels and pinions are removed, and the wooden pulley is fitted to the end of the shaft. The proper speed for the mower shaft to turn is about 300 r.p.m., and with the motor running at about 1,750 or 2,000 revolutions, the wooden pulley should be about six times the diameter of the motor pulley. The mower shaft must turn in the opposite direction to that in which it revolves when cutting grass. After the motor is started, a little oil and emery is fed onto the cutter edges and the horizontal knife at the bottom of the mower as well; they are then allowed to grind each other to a sharp edge by running the motor from 5 to 20 minutes. Ordinarily, the motor will have to be stopped at intervals and the knife set a trifle closer to the cutters by means of the adjusting screws. The adjustment must not be made too tight or the motor may be overworked, and besides, the emery cuts better when the adjustment is little, if any, tighter than is proper for operating the mower.

Scale Attachment for Setting Calipers

Much work is spoiled as a result of wrongly or inaccurately set calipers. The usual method of setting inside calipers, by holding the end of the scale against a flat surface, is very deceptive, because if the scale is not exactly at right angles to the end surface, the calipers will be a little over or under the required dimension. Furthermore, as all ordinary calipers have rounded points it is no easy matter to see when the setting is correct.

The drawing shows a simple little attachment that makes the setting of calipers easy and accurate. It is made in three parts, consisting of a stationary endpiece into which a piece of 1/8-in. steel wire is tightly driven, and a sliding block. The wire is bent over at its outer end, and a "V" is filed so that the scale makes a snug sliding fit in the attachment, the opposite end of the scale resting against the endpiece. When using, the sliding block is moved to the required dimension as indicated by the scale, where it is held by the thumb until the calipers are set. When setting outside calipers, the legs are, of course, set against the outside of the endpiece and sliding block, the latter being located on the scale accordingly.

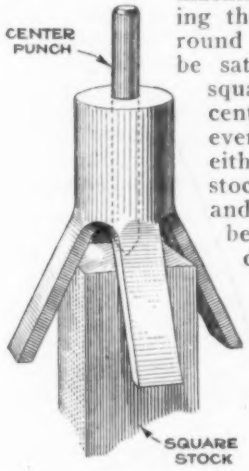


Preventing "Sweating" of Concrete

Much trouble is caused by the "sweating" of concrete walls on the inside; this is usually caused by faulty construction, as concrete walls, like masonry, should be built with a dead-air space between the wall and the interior plaster. Many types of concrete walls provide for hollow spaces within the walls, but, in addition to this, the interior plaster should be furred out so as to leave a continuous dead-air space between it and the concrete. In the case of barns, as cattle give off a large amount of moisture, some adequate system of ventilation is also very desirable.

An Improved Bell Center

Almost every mechanic is familiar with the usual type of bell center used in machine shops for marking the centers on rough round stock; this cannot be satisfactorily used on square stock. The bell center illustrated, however, can be used on either square or round stock with equal facility and satisfaction. As will be observed from the drawing, this center has four equally spaced arms radiating from the body at an angle of 30°. When in use, these arms rest upon the edges of the square-stock face, insuring a more accurately located center than can be obtained by the use of the ordinary type, as this would rest on the corners, which generally have a heavy burr on them that throws the center off.—Chas. Homewood, Ontario, California.

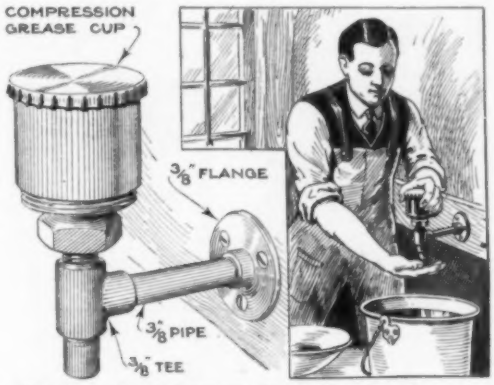


A Saw-Filing Kink

When filing a saw, swab the teeth with a solution of copper sulphate (bluestone or blue vitriol) and water. This will deposit a thin coating of copper on the metal, and when the first set of teeth are filed, the unfiled teeth will show up very distinctly. This idea will be found a great help, especially where the light is poor.—F. L. Schneider, Palmer, Mass.

Handy Container for Soft Soap

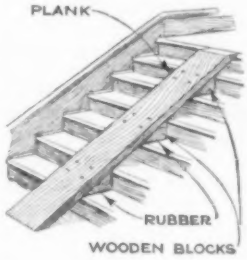
A useful and economical method of holding soft soap, prepared hand cleaner, or left-over pieces of soap in the shop or garage, is to place the soap or cleaner in a large-sized compression grease cup. The grease cup is screwed into a tee, and is fastened to the wall or woodwork by means of a short length of pipe and a pipe flange in the manner shown. The outer end of the horizontal pipe is plugged to prevent the soap from running into it. In use, one hand is held underneath the tee while the other is used to screw down the cap, which forces the soap out through the bottom.—Herbert A. Strickler, Buffalo, N. Y.



Soft Soap, Hand-Cleaning Compounds, and Fragments of Soap Contained in a Large-Sized Grease Cup are Economically Kept and Used in the Shop or Garage

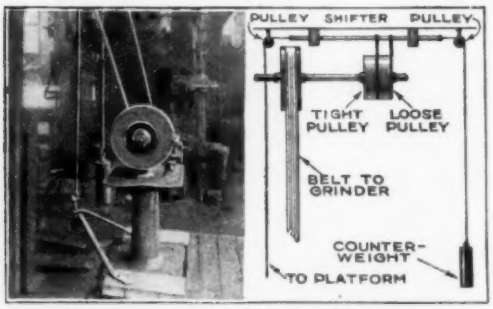
Skid for Use on Steps

In a large public building, where pianos and other heavy furniture are frequently moved over a short flight of steps, the plank skid shown in the drawing has proved very useful. Triangular blocks, attached to the underside of the plank, rest upon the stair treads, the number of blocks depending upon the length of the skid; one for every other step will generally be found sufficient. The undersides of the blocks are covered with rubber or felt to prevent scratching the steps. When not in use, the skid can be pushed to one side, where it will not interfere with the use of the stairs.



Automatic Belt Shifter for Grinder

Practically every shop experiences trouble because the workmen forget to stop the grinding wheel after they have



When the Workman Steps on the Platform, the Belt is Shifted from the Loose Pulley and the Grinding Wheel Started. When the Man's Weight is Removed, a Counterweight Pulls the Belt Back onto the Loose Pulley, Stopping the Machine

used it. In order to make certain that this would not occur in a small machine shop, the arrangement illustrated was installed, and worked with success.

A platform, surrounding three sides of the machine, is elevated at the end nearest the machine, and connected to one end of the shifter rod so that, as soon as the workman steps on the platform, the belt is shifted over onto the tight pulley and the wheel begins to revolve. When the weight of the man is removed from the platform, a counterweight attached to the opposite end of the shifter rod pulls the belt back over to the loose pulley, stopping the machine. This arrangement not only saves a lot of the men's time, but prevents accidents and saves power, as the grinder is running only when in use.—Ethan Viall, Barboursville, Ky.

Hacksaw as Facing for Core Boxes

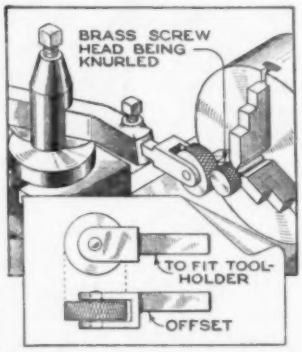
The cores from a half-core box were quite satisfactory while the box was new, but as the face of the core box was unprotected, the constant rubbing of the strickle, or strike board, soon wore down the face of the box so that the two half cores, when pasted together, formed an oval, instead of a round core. The core box was repaired and faced with tin, but this was soon cut through. It was then suggested that worn-out hacksaw blades be nailed to the edges of the box. The suggestion was acted upon, and since then there has been little or no wear on the core box as the hardened saw blades provide protection for the wooden edges.—M. E. Duggan, Kenosha, Wis.

Locating Cylinder-Head Gaskets

The difficulty experienced when the cylinder-head gasket shifts while the head is being placed in position on an automobile engine, can be avoided by the use of two simple locating studs. These consist of two cylinder-head bolts with the heads sawed off and slots sawed across their upper ends to facilitate removal with a screwdriver. The studs are inserted in diagonally opposite holes in the cylinder block, the gasket is placed over them, and the head put in position; when the bolts are inserted, they will coincide with the corresponding holes in the gasket, the studs, of course, being unscrewed when the head is in place.

Knurl Holder Fits Toolholder

A quantity of small brass thumbscrews were to have their heads knurled while the stems were held in a universal chuck. It was necessary to chuck the screws with the heads close to the chuck jaws, to prevent bending, and a regular toolpost knurling tool was found to strike against the jaws, besides being too heavy for the work. A hand-rest knurling tool, on the other hand, was not altogether satisfactory, and the difficulty was finally overcome by mounting the small knurl taken from the hand-holder in a specially made bracket, fitting into the 5/16-in. square hole in an offset toolholder. The bracket



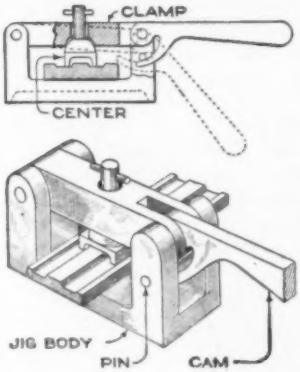
can be removed for use in a straight holder also, or in one offset in the opposite direction. While only one knurling wheel was used, the result on the small brass-screw heads was entirely satisfactory. The bracket was made of tool steel, for toughness, and the arms through which the knurl shaft passed were as thin as possible, consistent with strength, in order to allow the knurl to be used close to the chuck jaws. The square stem was offset to allow further clearance for the toolholder shank; by reversing the bracket, this offset can be made to come on the other side for use on work located close to the tailstock.

Cutting Springs after Winding

When making a heavy wire spring in the machine shop, it is generally coiled on a mandrel held between the centers of a lathe. After the spring has been wound to the desired length, it is a good plan to turn the lathe spindle backward a few turns before cutting off the wire. This relieves the strain on the spring, and makes it safe to cut the wire with a hacksaw or pliers without danger of having the end of the wire fly back.

Quickly Operated Jig Clamp

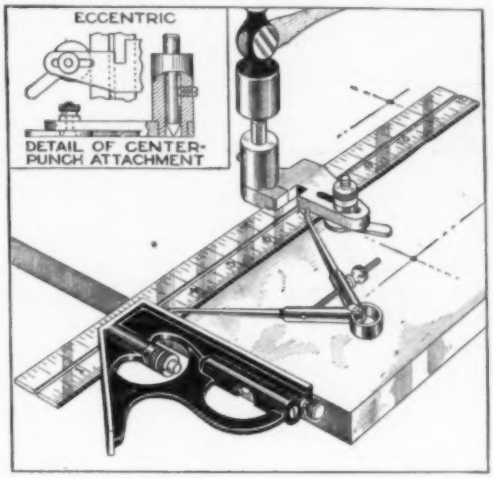
A quickly operated jig clamp is shown in the drawing. The clamp is made with four lugs, one at each corner, with the swinging leaf pivoted between two of them, the actual clamping being done by means of the cam-and-pin arrangement shown in the sectional diagram. In order to be sure of accuracy, the work is held by a floating foot, or center. A pin, driven through a hole in the top of the center shank, prevents it from falling out, and the center is ball-shaped so that it can adapt itself to the surface irregularities of the work.—J. H. Moore, Toronto, Can.



Center-Punch Attachment for Square

The attachment illustrated will be found a timesaver when laying out work. By setting the index mark on the attachment to a graduation on the square blade, any desired distance from the edge of the work can be prick-punched instantly; for greater accuracy, a pair of calipers, or an inside micrometer, can be used in setting.

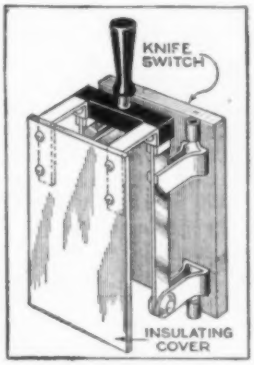
The base of the device, which is made of tool steel, is machined with a shoulder that fits against one edge of the square blade; a slotted extension opposite this shoulder carries a cam or eccentric that locks the attachment in place. The slot, and the construction of the cam stud, enable the attachment to be used on blades of varying widths. The punch is carried in a sleeve, forced into a hole in the shouldered end of the base; in line with the punch point, an index mark is cut on the base, and the edge of the slotted extension is milled or ground exactly in line with the punch point also. A flat filed on one side of the punch, and a small setscrew in the sleeve, prevent the punch from dropping out.



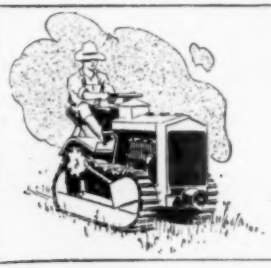
A Center-Punch Attachment for the Combination Square That will be Found Very Useful on the Laying-Out Bench

Guard Plate for Knife Switch

An unprotected knife switch is a real menace to the lives of those who work around it, especially if the switch is carrying a heavy current. If it is not possible to use the safety switches that are now accepted as standard, the exposed knife switch can be made practically safe by applying an insulating cover that will prevent accidental contact with the switch.



The drawing shows a method in use at one plant. Here a piece of sheet fiber, or other insulating material, is attached to the switch by metal brackets. The insulating material completely covers the switch blades so that in opening or closing the switch, the operator cannot come into contact with anything but the handle.—Clementine Paddleford, New York City.



SOME UNUSUAL JOBS FOR THE TRACTOR

By GEO. G. McVICKER

MANY farmers seem to be laboring under the impression that a tractor is only useful for drawing plows and other implements, and, when fitted with a power pulley, for driving a thresher or a circular saw. There are many other jobs around the farm, however, for which the tractor could be used with a consequent saving in time and labor. A few such jobs are here described.

The foundations of many barns and other farm buildings extend but a few feet below the surface of the ground, and very often the foundation walls will settle away from the building, due sometimes to undermining by rats, sometimes to heaving of the ground by frost. When this happens, only a small portion of the wall supports the building. I found this to be the case with one of my barns after the frost had loosened the ground. Rather than employ a mason to relay the wall, section by section, I decided to try using the tractor to push it back into place. This was accomplished as shown in Fig. 1. A 3 by 12-in. plank, as long as the wall, was placed with its broad face against the latter. I then attached a 4 by 6-in. timber to the drawbar of the tractor by means of a chain, allowing the timber to extend forward between the wheels and protrude several feet ahead of the tractor. I toenailed this timber to the 12-in. plank, started the tractor, and, allowing the clutch to slip slightly, moved slowly forward in low gear. The foundation was thus pushed into position and held firmly until I had tamped earth solidly underneath it. I did this job alone in a little over an hour; with jacks or crowbars it would have taken several men much longer. It might be necessary, in some cases, to relieve the foundation of the weight of the building side, but this could easily be done by using levers.

A jack is a tool seldom found on the farm, and when a small building is to be lifted, either for repairs to the foundation, or for making the foundation higher, or for placing rollers and skids under it, preparatory to moving it to a new location, crowbars are the tools commonly used. This method requires two or three men, and makes a tiresome and time-consuming job. The building can be lifted, one side at a time, by using the tractor; this demands but little preparation and no materials that cannot be found on the average farm. The first step is to spike or bolt a 2 by 6 or a 2 by 8-in. timber to one side of the building, at a suitable height above the ground. The tractor is backed to within about 6 ft. of the building, and a 4 by 6-in. timber is cut to such a length that it will reach from a point on the tractor frame just above the drive axle to the timber attached to the building wall. When this timber has been set so that it will stand a good push without slipping, the clutch of the tractor is slowly engaged, and the tractor, in reverse gear, moves back until it is against the building, as shown in Fig. 2. This action provides a powerful lifting effect, and raises the building as steadily and easily as a number of jacks. When the building is lifted, the tractor will hold it until blocking or skids can be placed in position, and then, by driving the tractor slowly forward, the building is allowed to settle on the blocks. The opposite side is lifted in the same manner, and if the building must be raised still higher, the operation is repeated, moving the timbers on the building lower, or using a longer lifting timber. This is a safe and practical method, and the work can, if necessary, be done by one man.

Removing rocks from a field to be seeded appears to be an ever-waiting job for the farmer in localities where the ground is very stony, and many are inclined to farm around the larger ones because of the work involved in moving them. With the aid of the tractor, however, rocks too large to be otherwise moved, without first breaking them, are easily loaded on a sled, hauled to the rock pile or stone fence, and unloaded, without any hand lifting at all being necessary.

The sled used is no different from any common stone sled, except that a steel pulley is attached to the front end, as shown in Fig. 3. The only other piece of equipment necessary is a length of 7/16 or 1/2-in. steel cable, one end of which is fas-

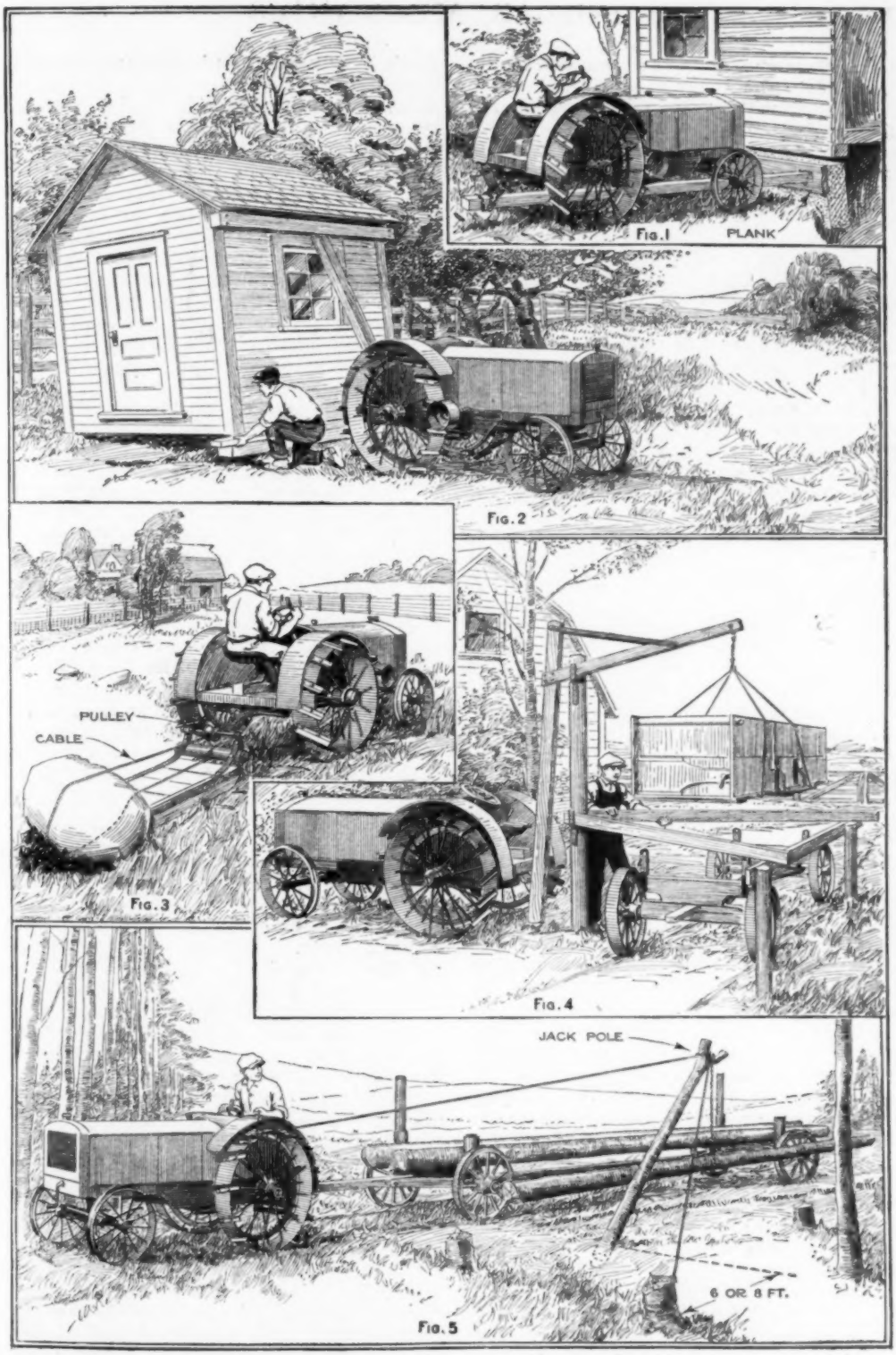


Fig. 1 Shows the Tractor Replacing a Foundation Wall; Fig. 2, Lifting a Building for Foundation Work, or Preparatory to Moving; Fig. 3, Loading, Hauling, and Dumping Heavy Rocks; Fig. 4, Removing a Heavy Wagon Box by the Aid of a Simple Device, and Fig. 5, Loading Felled Trees with a Minimum of Exertion

tened permanently to the front end of the sled, while the other is provided with a hook that will go into the eye of the tractor drawbar.

A hole is poked underneath the stone with a long curved bar, and the cable worked through it. The end is then passed under the pulley, and hooked to the drawbar. As the tractor is driven ahead, the cable rolls the stone up onto the sled, the backward pull on the sled holding it in place until the cable rolls the stone forward against the pulley. The sled will then start to move forward, and without having to stop, the journey can be continued to the rock pile. When this has been reached, the cable is unhooked, run over the top of the pulley, and hooked to the drawbar again. The tractor is then started, the cable rolls the rock from the sled, and then pulls the sled on over the rock, without stopping the tractor, as it is driven back.

I can, if necessary, lift a wagon box on or off the running gear by the exercise of "brute force and ignorance," but I don't like to do it, and I won't, so long as my tractor is at hand. I have a device rigged up, by the use of which so little time and manual exertion are required that it is a pleasure to watch it work.

I set one 4 by 6-in. post, 10 ft. long, 2½ ft. in the ground. At the top of this post, I pivoted a crossarm made of 2 by 8-in. timber, 9 ft. long, the pivot being a ¾-in. bolt, and the pivot hole bored 18 in. from one end. The bolt passes through the upright post on one side, the other end being held by a piece of flat iron, bent and attached to the post as shown in Fig. 4. To the short end of the 2 by 8-in. piece I bolted a 7-ft. length of 2 by 6-in. lumber, bracing the two as shown, with two pieces of flat iron. It will be seen that, when the wagon is on the gear and the crossarm is just at the top of the box, the upright arm is standing at an angle to the main post. Two loops of rope are placed around the box and over the crossarm, and the tractor is then backed against the upright lever arm. This raises the box clear of the running gear, which is then drawn from beneath, the cross supports shown in the illustration are placed in the brackets, and the box is lowered. One man does the whole job.

Loading the trees felled for the winter's fuel, or for a lumber supply, before hauling them to the saw, is easily a two-man job as ordinarily undertaken, and involves some heavy lifting. By using the method shown in Fig. 5, one man can do the work if necessary, and all manual lifting is eliminated. The necessary implements are a rope, ⅝ or ¾ in. in diameter, 50 ft. long, a piece of the same rope about 10 ft. long, a chain long enough to reach around the largest of the logs, and a jack pole, as illustrated, 10 ft. long.

Drive alongside the log to be lifted, about 3 ft. to one side. Wrap one end of the long rope around one of the mud lugs near the top of the tractor drivewheel, at the rear, and, at a point on the rope near the center of the log to be lifted, take a half hitch around one of the forks on the jack pole. The jack pole is set in a shallow hole, to prevent slipping, at the outside of the log, and inclined at an angle of 45°. The other end of the long rope is fastened to a stump, or a stake driven in the ground, about 6 or 8 ft. ahead of, and to the outside of, the jack pole, as shown. The log is attached to the jack pole with the short rope and chain; then, with one hand holding the end of the rope that is hitched around the mud log, slowly engage the clutch. As the tractor moves forward the rope will be wound on the drivewheel (the tractor should be steered so that it will), and the log is lifted. As soon as this happens, the jack pole begins to swing in, as the part of the rope between the pole and tractor is always taut, while that between pole and stump begins to slacken as soon as the log is lifted. As the forward movement continues, the jack pole is pulled in farther until the log is dropped in the center of the wagon.

The placing of the jack pole, wagon, and stake demands a little bit of judgment, but after a few trials, the correct relative distances can be estimated with considerable accuracy, and the work will proceed with dispatch.

Several other unusual chores for the tractor have come to my attention, such as using it as a snowplow, by attaching a V-shaped frame covered with boards to the front axle, and for heavy hoisting, by attaching the end of the falls of a block and tackle to the drawbar, then driving the tractor forward; these are but a few of the many that will occur to the wide-awake reader.

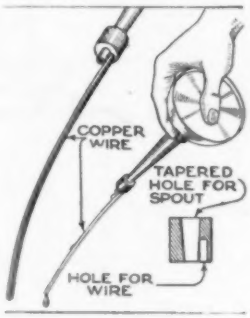
Prolonging the Life of Emery Belts

The life of emery belts can be considerably extended by treating them with paraffin wax. The wax is applied to the surface of the moving belt, or may be put on when the belt is idle. After applying the wax, it will be observed that

only the cutting edges of the abrasive grains are visible, the voids between the grit particles being filled with wax. This is the secret of the extra-long wear. As any chips or metal dust cut from the work are forced into the wax, the emery is free to cut instead of clogging and breaking off. This method is especially useful in brass and aluminum work, as this material has a tendency to fill in more than harder metals. However, when the belt has finally filled up and become smooth, it may be made to look like new by using a file card to clean out the accumulated cuttings, after which another coating of wax is applied.—S. S. Sutherland, Detroit, Mich.

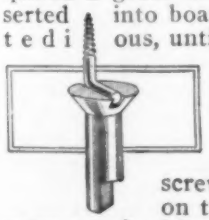
Increasing the Oilcan's Reach

By the simple expedient of making a small collar, having a tapered hole, to fit over the spout of an oilcan, and attaching a suitable length of stiff wire to the collar, the range of the oilcan may be considerably increased. The wire, preferably of copper, is soldered into a hole in the collar. In use, the collar, with its attached wire, is slipped over the spout of the oilcan; the oil follows the wire and makes it possible to direct the lubricant into otherwise inaccessible places. The attachment can be put on or taken off the spout in a second.



Driving Screw Hooks Quickly

The manual-training class of a high school, in carrying out a project that required a gross of screw hooks to be inserted into boards, found the job very tedious, until the tool shown in the drawing was made. It was made from a stove bolt having a shank that would fit into the chuck of a spiral screwdriver, a flat being filed on the end of the shank to correspond with that on the screwdriver bits. The slot in the bolt head fits over the screw hooks, and inserting them then became a very simple matter.—N. E. Studebaker, Houston, Tex.

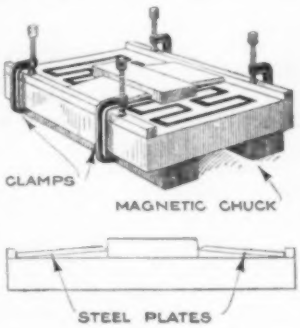


A Carriage-Bolt Holder

Carriage builders, automobile - body workers, and others who have frequent occasions to remove carriage bolts, are familiar with the tendency of the bolt to turn with the nut. As the head of the bolt is round, it is not always an easy matter to get a grip on it that will hold without damage to the adjacent woodwork. The simple tool illustrated has been used for a number of years by a man of long experience in work of this character; it should be made of the best tool steel and tempered as hard as a screw-plate die. The teeth are beveled, and the bevel must be on the upper side.—C. S. Simmons, Cache, Okla.

Holding Nonmagnetic Materials on Magnetic Chuck

In surface grinding brass, or other nonmagnetic parts, considerable trouble is experienced if the grinding machine is equipped with a magnetic chuck. In order to do the work, either the vise or special planer clamps must be used, that is, if the work is flat, as in the drawing. Such flat work, however, having plane surfaces, can be held on the magnetic chuck by using two steel plates of the kind illustrated, one on each side of the work, with a support behind them. The plates should be of such a width that, when placed between support and work, they will lie at a small angle to the surface of the chuck. The edges of the plates are beveled, and the beveled edges are placed as shown; when the current is turned on, the plates are pulled tightly against the work, clamping it to the chuck.—John Homewood, Ontario, Calif.



Stacking Hay by Gravity

A western rancher raises alfalfa in summer on the plateau above a swiftly running river, which never freezes. His home and feed lots are located in the river valley below. It was not long until he encountered trouble in hauling the hay down to the river bottom, and he proceeded to eliminate the necessity of hauling, as well as much labor, by building a chute from the hayfield above to the feed lot. The chute is about 400 ft. long, about 8 ft. wide, and has a semicircular cross section. Throughout most of its length the chute rests on the earth. The lower end, being elevated so as to form a stack, is carried on a timber frame.

A Western Rancher's Method of Stacking Hay by Gravity: His Crop is Raised on the High Land, Whence It is Shot down a 400-Foot Chute to His Feed Lot in the River Bottom

From 50 to 75 tons of hay are shot down the slide each season, and a load can be put down in the same time as required to put it on a stack below, as a stacker is also used at the top to move the hay from the wagon and drop it onto the chute.

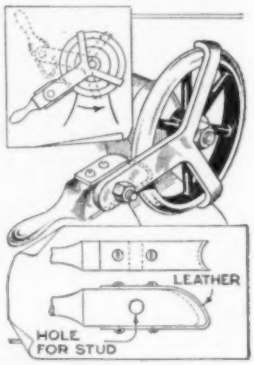
Flesh or Grain Side for Belts

Many discussions have taken place in the past as to whether the grain or the flesh side of a leather belt should be run next the pulley. Definite data were entirely lacking, however, until a series of tests, covering a period of more than two months, and using five 4-in. single-ply belts, made by various makers, each belt being 30 ft. long, were made at Cornell University. All five belts were thoroughly run in before the tests, and every effort was made to reduce the possibility of error to a minimum.

The method of testing was to take horsepower readings from the belts, when running on each side, the power being increased gradually until four per cent slip was reached. The results indicate clearly that the grain side is undoubtedly the best for power transmission, the flesh side transmitting, under shop conditions, on an average only about 50 to 60 per cent as much horsepower as the grain side. Under a higher tension than is usually found in the shop, however, the flesh side shows a higher efficiency than this; under very favorable conditions, as high as the grain side. The tests show that there is a distinct advantage to be gained by running a belt with the grain side next the pulley.

Lever for Tailstock Handle

When drilling large holes in the lathe, extra leverage on the handwheel of the tailstock spindle makes the work easier for the operator. The attachment illustrated forms a handy way of getting the extra pressure against the drill point, as it is quick-acting and need not be removed from the handwheel in order to clear the lathe bed. The lever is made from two pieces of cold-rolled steel, one of ½ by 1½-in. flat stock, which is forged to form the forked section, and the handle, made of stock to suit the width of the wheel. The ends of the fork are bent over to conform to the contour of the wheel, while the handle is turned at one end to form a good grip, and drilled near the other for the stud that holds it to the fork. The end of the handle is filed to the same radius as the wheel, and a piece of soft leather is passed around this end and held in place with screws. Downward pressure on the handle causes it to grip the wheel tightly, and apply the necessary pressure. When the lathe bed is reached, a quick upward movement releases the wheel and enables the operator to take a new grip.

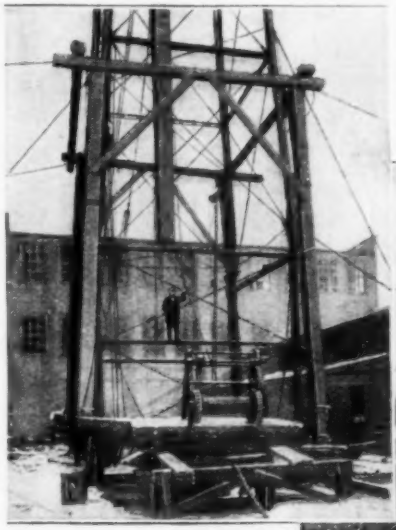


Raising a Water Tank 25 Feet

As a rule, when increased height is required for a water tank, the old one is scrapped and a new one erected, or if the condition of the old tank warrants, it is dismantled and then rebuilt on a new support; both of these methods involve the expenditure of considerable time and money.

The photographs illustrate a method by which a 60-ton tank was elevated a distance of 25 ft., and new sections built into the steel tank support, without disturbing the tank. A wooden support was built around the base of the tank, the corner members of which were 14 in. square and 40 ft. long, while the rest of the framework and the braces were made from 8-in. timber. Two heavy chain falls were fastened to the crosspieces, at opposite corners, and cable tackles and winches were attached to the other two corners. The cables were then fastened to each corner of the tank supports. Six guy wires were attached to the bottom of the water tank proper, to prevent it from falling or moving under the influence of the wind. Each of the guys was provided with a tackle block, and as the tank was raised, the guys were slacked away, while keeping them tight enough to hold the structure steady.

When the tank had been raised the proper distance, the new ironwork section was slipped into the gap and joined to the bottom of the old steel frame. The new section measures 24 ft. square, and the tank now stands 100 ft. in the air.—W. K. Crosson, Detroit, Mich.



Left: Raising a 60-Ton Water Tank a Distance of 25 Feet by Building a New Section into the Old Steel Frame. Right: During the Lifting, the Tank was Stayed by Six Guys Fastened underneath the Tank. As the Tank was Lifted, the Guys were Lengthened

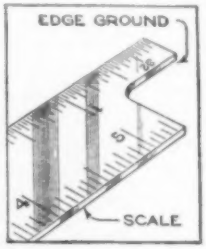
Testing Engines at the Muffler

Many present-day automobiles are built without muffler cut-outs, and with such effective mufflers that it is difficult to tell, from the exhaust, when the engine is missing explosions. In a noisy shop the exhaust can hardly be heard at all if the throttle is nearly closed. Under such conditions, a strip of tin can be used to determine when the engine is "hitting" on all cylinders.

This strip, which should be about 12 in. long and 4 in. wide, is held by one end in the fingers, so that the opposite end rests over the exhaust-pipe opening. The rhythmic striking of this tin strip on the pipe indicates perfect operation. A pause, or "miss," in the stroke is noticed when explosions are missed, regardless of how slowly the engine is operating. By this means, adjustments may be made on the spot without the necessity of a road trial.

Scale Used as Depth Gauge

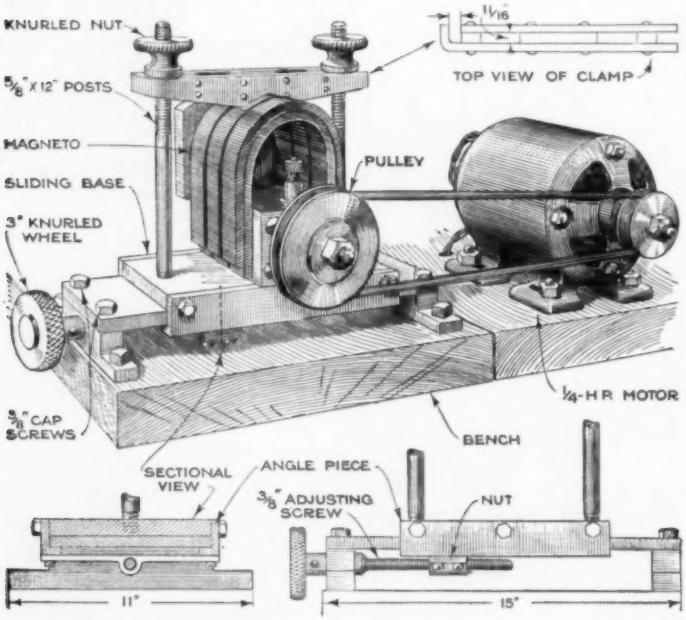
Mechanics and others who frequently have occasion to measure the depth of small openings such as countersunk holes, short slots, and the like, will find the scale altered as illustrated very convenient, because, as a rule, the width of the ordinary machinist's scale is too great to permit the taking of such measurements. To convert the ordinary 6-in. pocket scale into a combination scale and depth gauge, it is only necessary to grind away one side of it for a short distance from the end, reducing the width of the scale so that it can be used in the smallest opening encountered.—P. A. Daschke, Astoria, N. Y.



Magneto and Generator-Testing Base

By J. V. ROMIG

NO electrical-appliance repair shop, or even garage, is complete in its magneto and generator department unless it has a testing stand or base on which to clamp the repaired units and test them under actual running conditions. In the device illustrated, the generators, starting motors, or magnetos are held rigidly, and a ¼-hp. electric motor is large enough to drive nearly all ordinary types of generators and magnetos. The magneto or generator is placed on the sliding base of the tester, the pulley adjusted in line with the driving pulley on the motor, and the clamp tightened. By moving the base away from the motor, which is done by turning the adjusting wheel on the front of the device, the proper belt tension is secured for driving the unit under test.



When Testing Magneto and Generator Units, Some Sort of Test Stand is Required to Hold the Piece Securely If It is to be Tested under Service Conditions. The Device Illustrated Eliminates Vibration While under Load

Cold-rolled steel is the best material for building the base, a piece ½ by 7 by 15 in. being used for the bed. This is bolted to two pieces of 1 by 2-in. stock, shaped as shown, to form the feet of the tester. The sliding base proper is made from a piece ¾ in. thick by 7 in. wide and 10 in. long. This piece is fitted with angle members on its sides, to make a carriage that will slide on the bed, and is also drilled and tapped for the two upright standards, which have a short thread on their lower ends. A flat piece of brass, is shaped with a boss, and, when drilled and tapped, is used as a nut for the adjusting screw; this piece is fastened to the angle members by small ¼-in. round-head screws. The adjusting screw is made of steel, and is fitted with a knurled handwheel, 3 or 4 in. in diameter. The clamp that holds the electrical units down on the base is built up of ⅜ by 2-in. flat-bar stock, riveted together, with 11/16-in. spacers between the two sides. One end of the clamp slips under the tightening nut in a longitudinal direction while the other swings radially, making a handy and quick-acting clamp. By notching it out in the center, as shown, it will hold the units under test tightly and squarely, and prevent them from slipping around. Holes are drilled in the feet, and the device is bolted to the bench in line with the motor. The motor switch should be mounted underneath the bench, to prevent it from being damaged by accident.

Acetylene as a Primer for Cold Engines

There is no question but that acetylene gas is very effective when used to start cold or balky internal-combustion engines, but in the opinion of many engineers of wide experience, such use is very dangerous. The explosion of acetylene gas is so much more violent than that of gasoline or kerosene vapor, for which the engines are designed, that there is considerable likelihood of blowing off the cylinder head or breaking the piston.

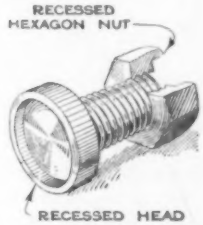
Acetylene gas is more easily ignited than a mixture of gasoline vapor and air, especially at low temperatures; with some motors, if reasonable care is exercised, no accident is likely to occur, but with others, especially with those having heavy flywheels, representing considerable inertia, it is highly probable that the cylinder head or some other part of the combustion chamber will give way before the flywheel has turned sufficiently to remove the pressure, by permitting the piston to

move on the downward stroke. This is also largely true of ether used as a primer without dilution.

The use of an open flame in the air intake of an internal-combustion engine, as an aid to starting in cold weather, is seldom recommended, strange to say, yet this is very effective, offers no danger to the operator and practically none to the machine.

Jack Prevents Distortion of Pistons

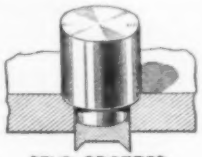
The illustration shows a device used to avoid the danger of springing pistons out of shape when new pin bushings are to be fitted. It consists of a round steel body, the smaller diameter being threaded, and the head having a recess cut in it to allow the bushings to project the proper amount through the boss without coming into contact with the jack. The threaded shank is fitted with a hexagon nut, the outer face of which is recessed in the same manner as the head on the opposite end.

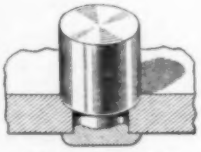


To use the jack, it is placed between the pin bosses, screwed tightly against them, and the bushings are inserted, after which the nut is slacked far enough to allow the device to be removed.—Edwin Kilburn, Spring Valley, Minn.

A Riveting Kink

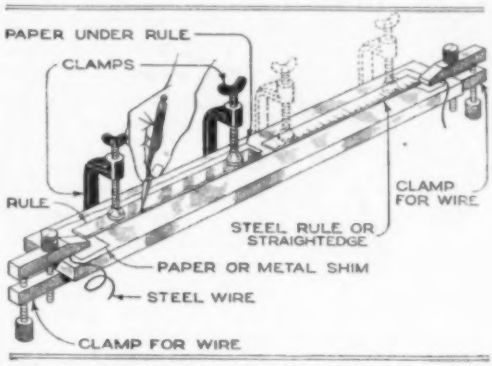
In cases where a stud is being turned in the lathe for insertion into any part to which it is to be riveted, the work of riveting can be greatly facilitated, and a more permanent fastening obtained by means of a simple dodge. This consists in cutting a concave spot in the end, as shown in the drawing; the resulting ridge is quickly upset with the ball peen of the machinist's hammer, and considerable time is saved, as the ridge turns over quickly under the hammer blows and provides a substantial head.—G. A. Luers, Washington, D. C.





Scribing Long Straight Lines

When a long straight line is to be scribed on a metal surface, and no full-length straightedge is available, a close approximation can be reached, with careful work, by means of a fine steel wire,



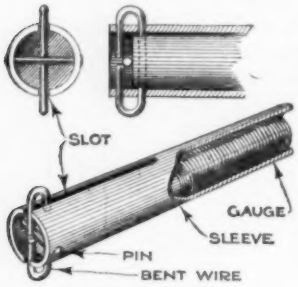
When a Long Straight Line is to be Scribed and a Single Straightedge of Sufficient Length Is Unavailable, an Approximately Exact Line can be Drawn by Alining Two or More Straightedges

tightly stretched, and clamped to each end of the work. In the drawing, a steel bar is shown, as a simple example, which requires a line scribed down its length. The wire used is preferably steel piano wire, although iron or copper wire can be made to serve. There must be no kinks or bends in the wire, and to help remove such as are not noticeable, clamp one end of the wire in a vise and stretch it by hand as much as the material will stand without actual rupture; then do not allow it to become bent before using. Stretch the wire as tightly as possible upon the work and clamp the ends; if the scribed line is to extend to the ends of the work, carry the wire down over and clamp it at some other point. Make sure the wire does not touch the work enough to be thrown out of true, though it should lie as closely as possible to the surface. Shim up under the ends with paper or thin metal if necessary. Then procure two or more steel rules or straightedges and clamp them along so that their edges just touch but do not move the wire. Use a magnifying glass in setting them, if accuracy requires it. After the straightedges are alined and clamped, with thin paper under them as a safeguard against slippage, remove the wire and scribe a line against their edges.

¶Small protruding points in the bottom of the box that retains the oilstone, will prevent it from slipping when it is used on the bench.

Protecting Small Thread Gauges

Thread gauges of the smaller sizes used around the shop very frequently have their usefulness impaired by the numerous knocks they receive in the course of the day's work. Often, too, vibration will jar the gauge off the bench, or some heavy tool will be dropped on it by the careless or busy mechanic. Accurate thread gauges are expensive to make, and are well worth protecting; for this purpose the device shown in the drawing will be found simple and effective. A sleeve is made to fit the largest diameter of the gauge, and long enough to cover its entire length. A slot is cut in the sleeve for about half its length, and at right angles to this, near the slotted end, a hole is drilled, and a pin driven in. The gauge shank is then drilled, close to the end, a drive fit for a 3/32-in. wire, after which it is inserted in the sleeve, and a piece of the wire is driven in. The ends of the wire are bent over the end of the shank in the manner shown, and adjusted until the ends will just spring over the pin in the sleeve. When in use, the gauge is pushed forward by grasping the bent wire, and when not in use, it is pushed back into the sleeve until the ends of the wire snap over the pin.



Type Cases to Hold Small Parts

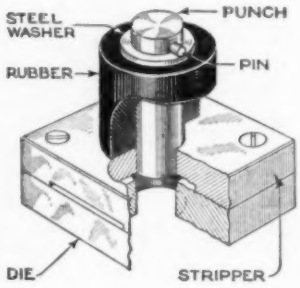
Every workshop has as a part of its stock or equipment an assortment of small screws, nuts, bolts, and similar small articles, which are difficult to store and classify. To keep these things in order and within reach when wanted, requires a number of small compartments or containers.

One of the best ways of sorting and keeping in order such a stock of small articles is to use printers' type cases. The case is a drawer about 32 in. long, 16 in. wide, and 1⅜ in. deep. It is divided into small compartments by wooden partition strips. A "double" case has 49 compartments or "boxes," 2 in. square, on each side, or a total of 98 divisions. A "triple" case has three lots of boxes, 1¼ by 2 in., or a total of 147 compartments. Several other arrangements of the partitions and divisions can be obtained. The boxes or compartments give room for but a few of each of the pieces and parts, but they provide a rather complete stock in a very small space, where they are always kept in order and ready for use.

Old type cases can be obtained at bargain prices from print shops and supply houses, or new ones, together with stands for holding them, if a number are to be used, can be obtained from type founders. Such a case, mounted as a drawer, underneath a bench, will quickly prove its value.—James W. Cottrell, Hammonton, N. J.

A Simple Punch and Die

A die for experimental work, which is simple and economical of construction, is shown in the drawing. The die is made of casehardened machine steel, and is screwed and doweled to a cast-iron stripper. The shape of the die is scribed off onto the stripper, which is then machined out to fit the punch. The punch should be made a good fit in the stripper, as it serves as a guide for the former. The punch is made sufficiently long to permit a rubber washer or sleeve to be slipped over it; this sleeve rests on top of the stripper plate. A hole is drilled near the top of the punch for a pin which holds a steel washer in place against the rubber. The rubber sleeve is compressed when the blank is being punched out, and is strong enough to pull the punch from the stock. Such a die can be operated in a vise or arbor press.



Testing Ink for Acid

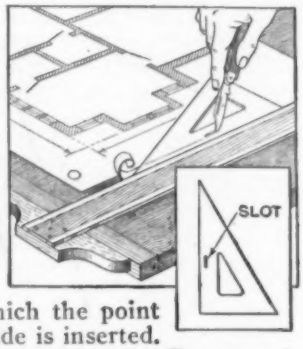
A simple method of testing ink, or other fluids, for the presence of acid, consists in dropping some of the liquid under suspicion into a solution of washing, or baking, soda. If the ink is acid, the resulting reaction between the acid and the alkali will cause foam to appear. Blue litmus paper can also be used; this turns to a red or pinkish tint when brought into contact with an acid.

Tightening Nuts with Rounded Edges

When repairing the car, it often happens that nuts which are to be removed from some awkward location have been "chewed up" to such an extent that the edges have become rounded, and it is difficult to grip them properly. A socket wrench will usually slip around over such a nut without moving it, especially if the wrench itself is a little worn. One car owner, who does his own repairing, finds that by placing a piece of fairly heavy cloth over the nut, and then forcing the socket wrench over this, nuts in this condition can be loosened or tightened easily.—A. E. Swanson, Los Angeles, California.

Trimming Drawings with a Knife

When trimming drawings with a pocketknife, using the T-square as a straightedge or guide for the blade, it often happens that the blade of the T-square is damaged. To prevent this, yet insure that the drawing will be cut in a straight line, a narrow slot can be cut in a triangle through which the point of the knife blade is inserted.



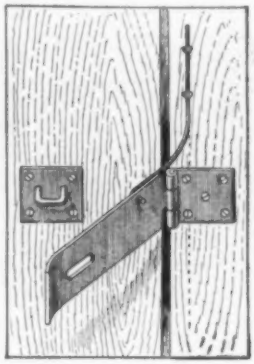
In trimming a drawing, the T-square is placed so that the slot in the triangle will fall on the trim line; it is then only necessary to insert the knife blade and draw it to the right, the triangle sliding easily along the edge of the T-square.—A. K. Harrison, Chicago, Ill.

Grinding Holes Straight

A simple visual method of testing holes for straightness, while grinding, is as follows: When the wheel is in to the full depth of the hole being ground, feed it to the opposite side until it just touches the wall. Then withdraw it from the hole and note the sparking. If the sparks are heavier near the front of the hole, the diameter is smaller at that point. When the grinding wheel is moved over to the opposite side and the sparking is the same throughout the bore as the wheel is withdrawn, the hole is straight.

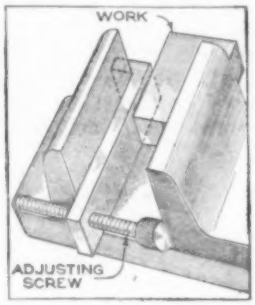
Preventing Hasp from Breaking

When a padlock hasp becomes jammed between the door and its frame, it is not uncommon that the hasp is broken or pulled from its fastenings. Naturally, if the hasp could be kept out of the way, this would not happen. The arrangement illustrated not only keeps the hasp from between the door and frame but does it automatically. A hole is drilled in the hasp at the point shown, and a bicycle spoke is run through it and fastened to the door frame with staples, so that it can just slide. Owing to the tendency of the springy wire to straighten itself, the hasp will be thrown back automatically as soon as the lock is removed.



Adjustable Block for Hacksaw Vise

The movable jaw of a hacksaw vise is made to swivel on a stud or screw in order to get a firm grip on rough work, that is, in consequence, probably of unequal width. This, however, is the cause of a great loss in time when it is desired to hold short pieces of work which may be less than half the length of the vise jaws. It is impossible to hold such pieces securely without packing up the other end of the jaws to the same width as the work to be held.

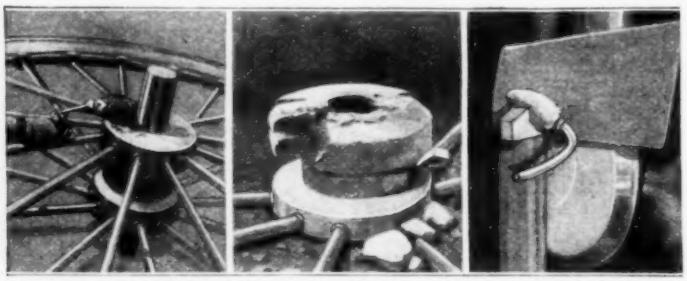


The attachment shown in the drawing will be found much handier than the usual array of nuts, washers, broken saw blades, etc., generally used. The fixture is clearly illustrated, and is simply a piece of flat stock bent over at one end and tapped at the opposite end, as close to the vise as possible, for a knurled screw. The work is held between the attachment and the movable jaw, gripped tightly, and the screw tightened against the opposite end of the jaw.

Some Ingenious Uses for Dynamite

By J. L. BALL

IT requires an emergency job to sharpen the wits of the mechanic to a keen edge; this is especially true around mines, where crude methods are sometimes required to get results, and some of these methods are as unusual as they are effective. It was necessary to replace some sheave wheels because the rims had become badly worn by the hoisting cable. These sheaves, or bull wheels, are in the headframe of the tipple, and should one of them fail from any cause, the damage would be considerable on account of the heavy weight of the steel cages and the loaded pit cars.



Left: A Sheave Wheel from the Headframe of a Coal Tipple, Removed without Injury to the Shaft. Center: The Effect of Two Charges of Explosive on the Sheave Hub. Right: Blasting Out a Tight Key

The new sheaves were exact duplicates of the old ones, and it was planned to use the old shafts, to avoid the necessity of fitting new journal boxes. After every known method had been used, without success, in the attempt to remove the old shafts, it was suggested that dynamite be used to burst or crack the hubs. The wheel was blocked up, 1-in. holes, 6 in. deep, were drilled in the hub at two opposite points, and a V-shaped notch was chipped from the hole to the outer edge of the hub. It required a half stick of dynamite, fired separately on each side of the shaft, to crack the hub, the shaft not being injured in the least. The left and center illustrations show the sheave before and after firing the charge.

The teeth of a large solid gear wheel of a clay-grinding machine were so badly worn that it was necessary to replace it with a split gear. The position of the gear, however, was such that it required considerable work to get at the key. A very small piece of 40-per-cent dynamite was placed in the keyway of the shaft and fired, driving the key out quickly. It will be well to remember that but a small quantity of explosive is required to do this work, and experiments should be made to determine this quantity, in order to avoid injuring the shaft and bearing.

In another case two cracked spokes made it necessary to remove a 6-ft. flywheel from a high-speed steam engine. The key was quickly removed by placing a small piece of dynamite behind the head of the key, as shown in the right-hand illustration, the end of the key being supported by a stout bar, to prevent its being bent downward.

Planting Sweet Corn

That sweet corn planted in June gives the best quality of corn is the contention of many expert gardeners, who maintain that the very highest quality is not obtained by earlier planting.

Sweet corn sown in the early part of May will produce a crop for the table in the latter part of July or early August, just when the summer is usually hottest. In these sizzling days the corn ripens so rapidly that only a portion of it can be picked at top quality. However, smaller early plantings, with the heavier plantings in June, will bring out the bulk of the crop during the last of August and early in September, when the weather is not so hot, so that the corn will ripen more slowly, and its quality remain at its best for a longer time. Corn is likely to remain longer in the "dough" stage in cooler weather, and be available for the table over a longer period. Plantings of corn 10 days apart until the end of June, provided the first was planted early in May, will give a crop succession from the last of July until well into September.

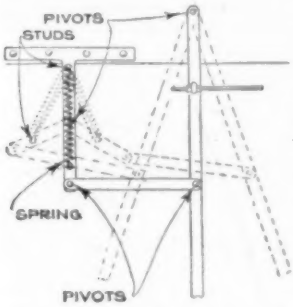
Corn planted in June gets a faster start because of the warmer weather, and grows more rapidly than that planted earlier, the young plants developing under ideal temperature conditions, which is also another reason why June corn is likely to have finer ears and be of better quality.

When the corn has reached a height of about a foot, a light sprinkling of nitrate of soda is of great benefit. Avoid

getting the nitrate upon the leaves of the plants, and rake it lightly into the soil. When the corn is from 2 to 3 ft. high, some of the balanced fertilizers, or bone meal, can be sprinkled lightly and hoed in; that is usually all that is necessary to produce a good crop. These extra applications will not be necessary if the soil is good, is rich to start with, and has been manured, but if there is any doubt about it, or in the absence of common manure, they will insure a good crop.

Making a Clutch Shifter Stay "Put"

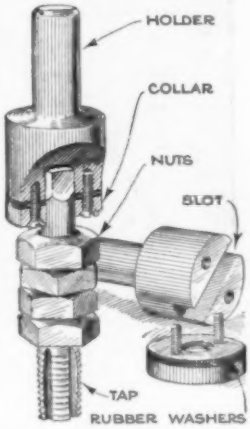
A manufacturing concern had trouble in making the clutch on the countershaft of a bolt cutter stay in the forward, reverse, or neutral positions, until the device illustrated was installed by one of the foremen. Two pieces of ⅜ by 1¼-in. steel were welded together at right angles to make a T-shaped piece, the horizontal member of which is screwed to one of the overhead timbers. The other member extends down, parallel to the shifter lever when the latter is in neutral. To the end of the vertical member of the T a short length of the same stock is pivoted, making a link that is free to swing to either side of its stationary support. Another link connects the shifter lever to the end of the pivoted arm in the manner shown. A coil spring is hooked over a stud riveted into the upper link near the lower pivot stud and over another located near the angle of the T. When the shifter lever is perpendicular, the link and spring are perpendicular also, and the lever has no tendency to move in either direction, but when the lever is thrown either to the right or left, the spring shortens and holds the clutch firmly.—Ralph Hanenkratt, Northville, New York.



The hole in which a broach is to be started should be drilled or bored. Using a broach in a cored hole soon impairs its accuracy. The face of the work that rests against the faceplate must be true with the bore, otherwise accurate work is impossible.

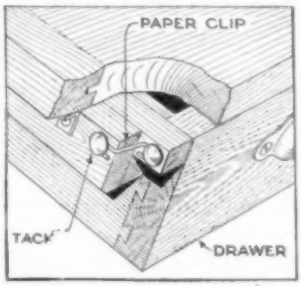
Novel Tap Holder for the Drilling Machine

Very often it is found necessary to retap large batches of nuts, which, for some reason, are too small. The holder shown is very convenient for securing and driving a tap quickly without any tightening device, thus enabling the operator to insert and withdraw the tap while the machine is running. The shank of the holder is turned to fit the drill chuck, while a slot, the width of the square on the tap, is cut across the front end. A collar is made, of the same diameter as the holder, and fastened to the latter by two screws. Between the collar and holder two rubber washers are placed. With the nuts held suitably on the drill-press table, the tap is pushed up in the holder. The rubber washers, being a wringing fit on the tap shank, will grip the tap sufficiently to keep it from falling, while the slot, of course, receives the square end of the tap shank and drives it. As many nuts as the tap shank will hold are tapped before the tap is pulled out and the nuts taken off.



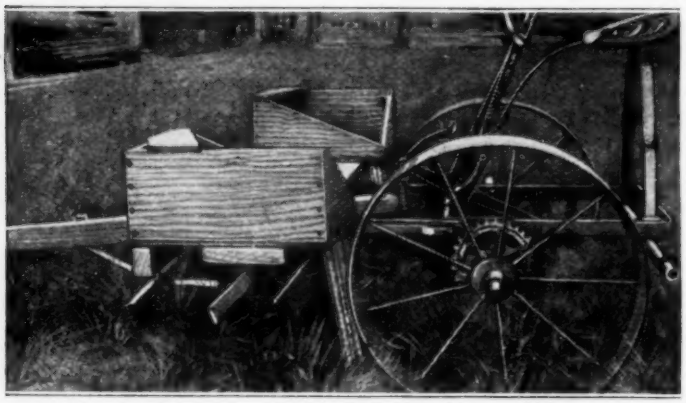
Keeping the Drawing-Board Drawer in Place

Draftsmen and artists using drawing boards of the type with a drawer on the underside, sometimes forget the presence of the drawer and tilt the board, dumping pencils and other materials onto the floor because the drawer slides out. In order to overcome this objection, and keep the drawer in its proper place on the drawing board, a paper clip is bent in the manner shown, thumbtacks being used to fasten the wire to the side of the drawer and the drawer slide respectively.



Potato Planter Made from Old Corn Planter

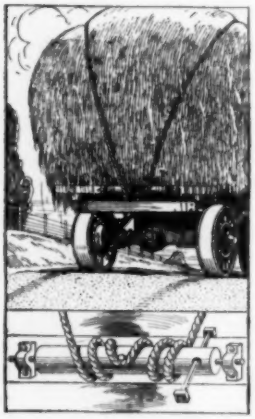
The owner of the old corn planter shown in the photograph saved considerable money when he conceived the idea of making it over into a potato planter. The seed-corn boxes were removed, and in their place two wooden boxes of the same size were attached. A hole was made through the bottom of each box, at the inside corner, and a length of galvanized-iron spouting was run down to within 3 in. of the bottom of each shoe. In using the planter, one man sits between the boxes and another drives. A peck or more of potatoes is placed in each box, and the cut potatoes are dropped through the holes in the boxes into the furrows. The ground should be prepared for planting by using a corn lister, which ridges the ground, leaving furrows between the ridges. After the potatoes have been planted, they are covered by driving a harrow over the ground. This method is much quicker than planting by hand, and when large tracts are to be seeded, there is considerable saving.



An Old Corn Planter That was Made Over into a Serviceable and Efficient Potato Planter: The Seed-Potato Cuttings are Placed in the Wooden Boxes and Dropped through a Spout into the Furrows

Windlass Holds Hay on Truck

With the introduction of fast motor-truck transportation into the business of farming, there came a demand for some means of securing loose hay in a manner that would make fast delivery safe. The solution comes in the form of a windlass. With this arrangement, the ends of a rope are fastened to the forward corners of the truck body, the loop is passed over the top of the load, and down to the rear frame, where it is wound around a windlass; this draws up the rope tightly. The windlass consists of a roller, in the center of which a pin is driven to hold the loop of the rope. The roller is mounted in brackets on the rear of the truck bed, with sufficient distance between the roller and truck to clear the rope. The windlass is turned by a rod, passed through a hole in the roller, and when the load has been tightened, the rod is allowed to bear against the frame so that it prevents the windlass from unwinding, but is still immediately ready for use. This last feature is one of considerable importance, since the hay will often settle, after a short distance over rough or bumpy roads, to such a degree that the rope will have to be drawn tight again, before further progress, without danger of spilling the load, can be made.—Roy A. Houston, S. Charleston, Ohio.



To Prevent Nails from Splitting Thin Wood

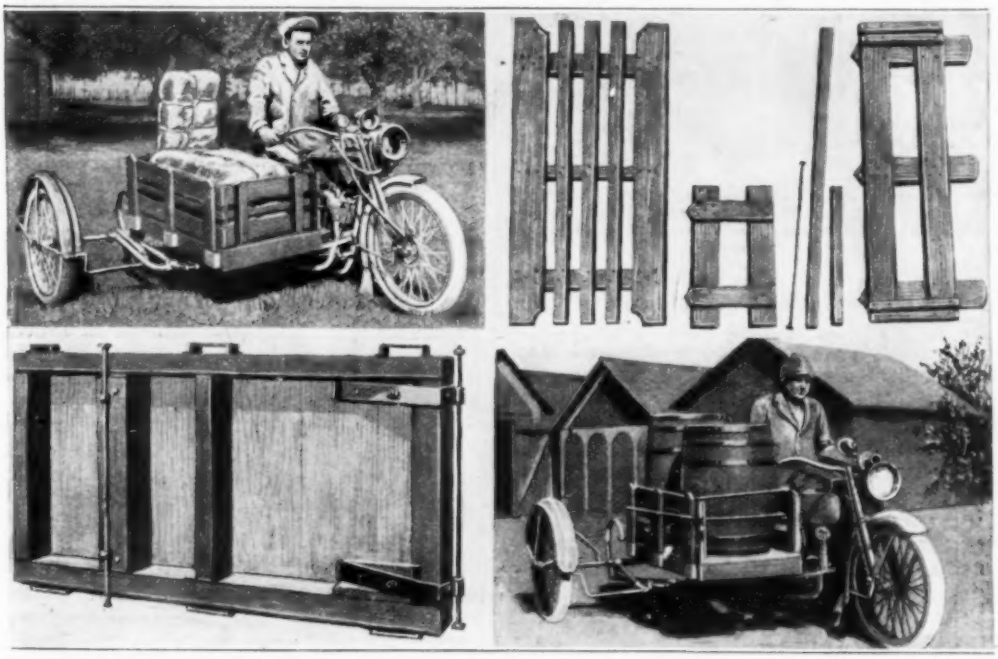
Having to nail a number of narrow strips, I found that the brads, as ordinarily used, would split them. Accordingly the points of the brads were flattened out or cut to a chisel-like point. By driving the nails with the chisel end at right angles to the grain not a strip was split. Of course, a bradawl would have answered the same purpose, but, even had there been one handy, it would have been a tedious job to punch a hole for each brad. Where the grain of the lower piece is at right angles to that of the top one, and is in danger of splitting, the nail is driven through the first piece as described, then given a quarter turn with a pair of pliers and driven home. This idea has been used on 20-penny nails with success.

A Motorcycle Delivery Truck

By J. R. KOONTZ

FOR several years we have had in use on our farm what one might call a "speed truck," one for quick delivery, where the weight of the load is not over 300 lb. It is very handy and useful, and there are hundreds of old motorcycles that have been discarded, not because of mechanical imperfections, but because of their shabby appearance, that are just the thing for such a truck.

If the motorcycle is equipped with a sidecar, so much the better. Remove the sidecar from the frame or springs and build the platform shown to take its place. This is built up of a framework of 2 by 4-in. lumber, covered with 1-in. boards. The necessary iron fittings for attaching the platform to the sidecar frame and motorcycle will vary somewhat with the make of the cycle used, but in general will not have to be very different from those shown in the illustration. Stake sockets are bolted to the sides of the platform. These are made of flat iron, bent to hold the stakes on the side racks, which have strips nailed to each end to form grooves into which the end members of the rack body fit. Two iron rods, threaded at each end and provided with nuts and washers, will be needed to hold the sides securely against the ends. The narrow strips shown in the upper right-hand illustration are used to make the openings in the rack smaller, for hauling chickens, and a cover for use in the same connection is also shown. A detachable seat can be made for carrying a passenger when necessary.

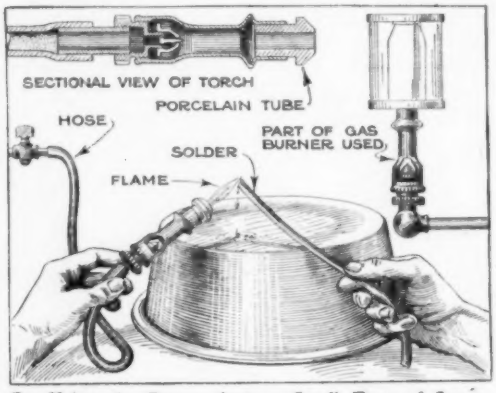


Upper Left: A Hurry-Up Trip from Town with a Load of Binder Twine. Lower Right: A Load of Two Barrels of Oil for the Farm Power Appliances. Lower Left: Construction of the Platform Frame and Arrangement of the Body Irons. Upper Right: Side and End Members of the Rack Body. The Part at the Left Is a Cover for the Body

A truck thus made can be used with profit on any farm, as a gallon of fuel will go twice as far in it as in any other truck that can be made or used; it is especially handy for hauling milk to the station, but there are innumerable other uses for it.

Homemade Soldering Blowpipe

It is possible to convert the burner part of a "junior" incandescent-gas lamp into a soldering torch that will eliminate



By Using the Burner from a Small Type of Incandescent-Gas Light, a Simple Soldering Torch can be Made. The Burner can Still be Used for Its Original Purpose

the necessity of using a soldering iron, except possibly for smoothing off the work.

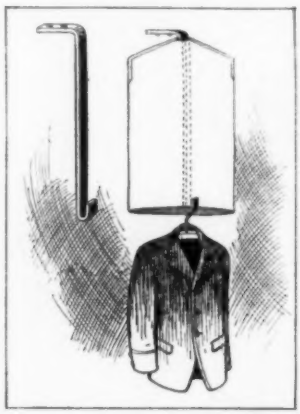
A short length of pipe is screwed into the bottom end of the burner for attachment to the gas hose, and a 1-in. length of porcelain-tube insulator is inserted into the upper end, to form a nozzle. The porcelain-tube insulator can be obtained from any electrician, and is the kind used to insulate electric wires passing through woodwork. All that remains is to connect the burner to the gas supply with a length of rubber hose, and adjust the supply of fuel at the mixer.—Herbert A. Strickler, Buffalo, N. Y.

How to Lay Sod Properly

Sod obtained on open land, as, for example, from close-cropped pasture, is the best for lawns. Such sod is exposed to the heat, and, being able to withstand drought, will naturally flourish under the excellent treatment it gets when removed, reset, and given water and every attention. If a drought should occur, this sod is better able to adjust itself to conditions than that taken from cool, sheltered places, where the grass is tender, and more apt to suffer from exposure to the heat of the sun. The average sod is laid down dry, on a dry surface, and then watered on top; this being so, it is a wonder that more lawns do not die before they can be brought into good condition. It sometimes takes two or three weeks of constant watering and attention to get sod laid in this manner started, while, if some attention were given the matter in the beginning, no trouble would be experienced. A good idea is to bring in the sod in the afternoon before the day it is to be laid. Prepare the lawn for laying by working it up; then sprinkle it moderately. Now arrange the sod in about the place it is to be grown, grass side down. After laying the sod in this manner, sprinkle it. Allow it to remain in this condition overnight, and start turning it early in the morning. Sod treated in this manner will take root and grow at once.

Bags Quickly Placed over Clothing

A commercial dyer and cleaner uses a device that may be of use to others in the same line of business, and that will also be appreciated in homes where the spare clothing and heavy winter garments are kept in moth-proof bags in the clothes closet.



The device consists of a long hook, made of flat iron, which is suspended from the ceiling at a convenient height above the wrapper's head. The bag is slipped up until its lower edge rests on the hook, then the clothes hanger, bearing the coat or other garment, is hung on the hook and the bag slipped down over it. The whole operation requires less time than the telling of it; the desirable features of the device will be apparent to anyone who has struggled with a long moth-proof bag.

¶When a car is driven in rain or snow and the headlights are fogged, point the spotlight directly on the engine hood. This makes it easy for other drivers to see the machine, so that accidents are prevented.

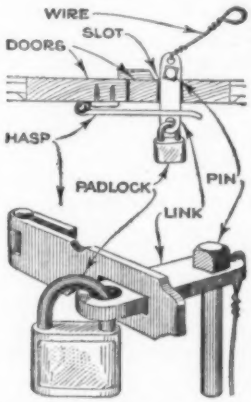
Portable Pen for Chicks

Growing chickens require green food if they are to thrive to the profit of the owner, and this is best provided when they have free range over a large field or lawn. Such freedom is not usually possible in the town or city, but movable pens can be made to keep the chicks under proper restraint. Such a coop, that adapts itself to surface irregularities and that can be easily rolled up and moved from place to place, is made from ordinary lath and wire.

A number of laths are cut in half, and wire is interlaced at the top and bottom to hold them together, two strands at the top and two at the bottom. At intervals, a somewhat longer stake, with the point sharpened for insertion into the ground, is provided. The pen can easily be set up in the form of a square or circle by bringing the ends together and driving the stakes into the earth.—G. E. Hendrickson, Argyle, Wis.

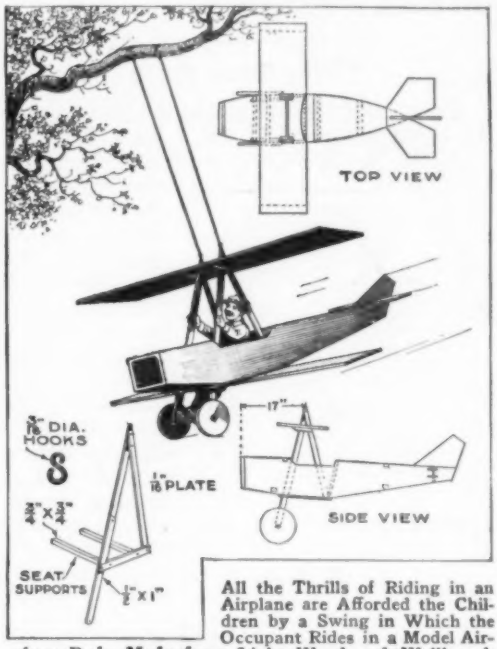
Padlocked Door Opened from Either Side

A plumber occupies half of a jeweler's store as a showroom and has his shop in the basement, driving into it through an alley in the rear. There is also a stairway into the basement from the first floor. When the plumber was in the store and wanted to take his truck out, it was necessary for him to walk a considerable distance to get to the rear of the building and unlock the padlocked door. In order to make it possible to open the rear basement door from the inside, the arrangement shown in the drawing was used. A piece of flat iron, drilled at each end to accommodate the padlock and a long bolt, passes through the eye of the hasp and through a slot cut in the door. The padlock is fastened through the outside hole and the bolt is slipped through the hole of the link which projects inside the door. A short piece of wire is used to pull the link through the slot, when closing the door from the inside.—S. A. Asquith, Los Angeles, Calif.



An Airplane Swing

Much more thrilling and nearer to flying itself than the sensation obtained from riding in an ordinary rope swing is the experience of sailing through an arc in a dummy airplane that is proof against side-slipping, tailspins, and similar mishaps.



All the Thrills of Riding in an Airplane are Afforded the Children by a Swing in Which the Occupant Rides in a Model Airplane Body Made from Light Wood and Wallboard, Suspended by Wire Rope

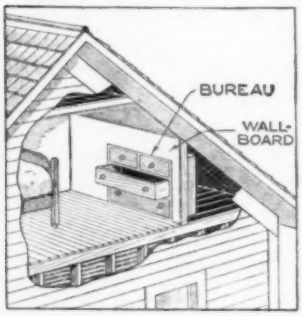
An airplane swing can easily be assembled, and will furnish endless amusement for the children. The triangular hangers are made of ½ by 1-in. stock, put together as shown, and the rest of the body is made of wooden strips, covered with wallboard. The ends of the hangers are bolted to a triangular steel plate, which has a hole drilled through its upper end for the accommodation of a hook. The planes are made of single sheets of wallboard, nailed to the woodwork, a segment being cut out of the rear edge of the upper wing to allow the occupant to get in and out easily.

No control stick is needed, as there are no movable surfaces, and the rider can hold on to the front members of the hangers, or an extra crossbar may be put between the members for that purpose. Bolts, with nuts and washers, should be used for joining the parts wherever possible, because, owing to the strain, the pieces would pull apart in a short time if held together with nails. The swing should

be suspended, preferably, by wire ropes, in any good spot where there is plenty of clearance for the body, and at a convenient height to enable the occupant of the swing to get in or out easily.—Donald W. Clark, Buffalo, N. Y.

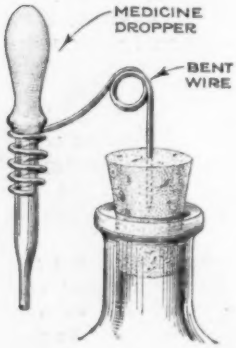
Saving Room Space

Considerable space can be saved in a room in some instances if the bureau is quite literally "built in," something after the idea suggested in the drawing. This is particularly applicable when partitioning off attic space into rooms, as there is always a great deal of unoccupied space in the angle formed by the partition, joists, and rafters. This makes a much more attractive and sanitary room than where no partition is employed, as the partition may be decorated, and the room is easily kept clean; it is almost impossible, without a vacuum cleaner, to remove all the dust from the angles of the usual attic room.—L. S. Sterling, Delanco, N. J.



Keeping the Medicine Dropper Handy

The medicine dropper is needed only seldom in most families, but when it is needed, it should be right at hand; to insure this, the simple little device shown in the drawing can be made in a few minutes. Make a coil of spring-brass wire, giving the main portion about four turns, then bend up a single loop and bend the end of the wire downward, to make a straight, vertical stem. This end should be filed to a sharp point, which can be stuck into the cork in the bottle. Kept in this manner, the dropper is always "on the job."—L. B. Robbins, Harwich, Mass.



Lens Hood Made from Drinking Cup

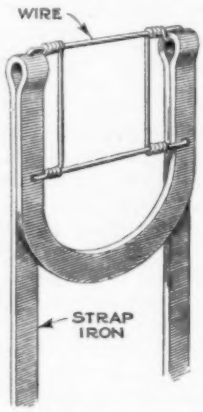
The amateur photographer is usually advised, when taking pictures with the lens pointing more or less directly toward the sun or other source of light, to use a lens hood, or cap. The reason for this is to prevent the light from striking the lens directly and causing overexposed spots resulting from the reflection of light. A lens shield of some sort is also frequently necessary when photographing scenes of sunlit snow and water, where reflected light is apt to strike the lens.

An excellent lens shade that collapses into a small space can easily be made from one of the familiar collapsible aluminum drinking cups, such as can be obtained for a few cents at almost any variety store. An opening is cut into the bottom of the cup just large enough to fit snugly over the lens mounting. The inside of the cup should be painted with some dead-black finish to avoid possible reflection.

A Good Foot Scraper

Ordinary types of foot scrapers fail in one thing: The bottom of the shoe can be cleaned on them, but the upper part of the toe, and the sides of the shoe cannot. With the scraper shown, every part of the foot can be reached.

A long piece of flat-iron bar is bent into a deep U-shape, the legs being spaced about 10 in. apart. The closed end is turned back in the manner indicated, and the projecting ends are either thrust into the ground or fastened to the side of the steps. Holes are drilled as shown, to permit a section of woven-wire fence to be fastened in the top of the U. This square of wire acts as the scraper by means of which every part of the shoe can be cleaned.



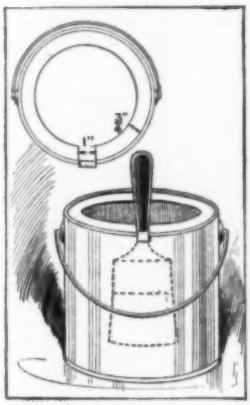
Growing Oriental Poppies

The oriental poppy is the showiest and largest-flowered of all hardy perennials, with its great scarlet or orange cups above a mass of thistlelike foliage; in late May or June it is the sensation of the flower garden. A single packet of seeds

will provide more plants than any one garden can ordinarily accommodate. They should be moved in August, as they are very hard to transplant, and invariably lose their leaves after removal, but these are not dead, and will appear again. It is best to sow the seed where the plants are to remain, rather than to transplant, and thin the seedlings out to about 2 ft. apart. This poppy entirely disappears after its blooming season, so that its location should be marked to prevent the roots from being destroyed by hoeing. It makes a growth of leaves in the fall so that its presence then can readily be determined.

Opening Paint Pails

The drawing illustrates an excellent way to open paint pails that are not fitted with friction tops. The center is cut out all around, about ¾ in. from the edge of the can; this leaves a strip of metal that may be left flat, or bent slightly upward, and that prevents the contents from splashing over the edge of the container. Two slits are cut in this strip, about an inch apart, and the metal between is bent back, thus forming a convenient holder for the paintbrush. When the pail is not in use, it is best to cover it with a piece of cardboard, as this generally fits better and keeps out more air than a tin lid.—Chas. Homewood, Ontario, Calif.

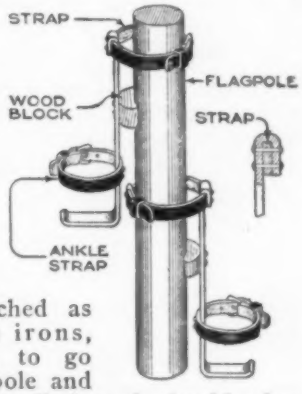


Judging Prints for Good Sepia Tones

When photographic prints are to be toned sepia, it is necessary that a pure black tone is obtained in the original development, in order that the prints, after redeveloping, may have the desired rich reddish-brown color. An effective way to judge whether any black and white print can be toned to a good sepia color is to view it by the light from a mercury-vapor light. If the black is not pure, it will have a grayish-black tone under this light, but, on the other hand, if it appears as a pure black it will produce a good sepia tone.—Chas. I. Reid, Dayton, Ohio.

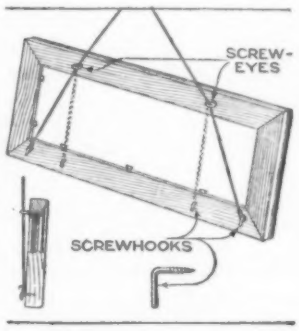
Improvised Climbing Irons

When a large flag became fouled around three of the flagstaff guy wires, the only way it could be untangled was for some one to climb the pole. To meet the situation the man undertaking the job built the pole-climbing irons shown in the drawing from 5/16 by 1½ by 1¾-in. iron. Straps, 1¾ in. wide and attached as shown to the irons, were provided to go round the flagpole and the ankles of the climber, the buckles being placed on the outside so that they could be tightened during the ascent. A block of wood, curved on the underside to conform to the contour of the pole, is riveted just a little above the center of each iron. In use these wooden blocks operate as fulcrums when the wearer's weight is applied, causing the strap to grip the pole tightly.—Maurice Staller, Fowler, Ind.



Hanging Framed Pictures

When making a very light picture frame, 3 ft. 6 in. long by 12 in. high, and suspending it in the usual manner, the weight of the glass was found to create a strain on the lower part of the frame, and to exert a tendency to force the frame apart at the lower corners. To overcome this trouble, the picture frame was suspended as shown in the drawing, so that the whole weight of the frame was supported by the lower member. Two screwhooks are screwed into this member of the frame, and the wire or cord is passed through screweyes in the upper part. The supporting wire can also be arranged as shown by the dotted lines.



Helps for the Berry Picker

The harvesting of berries, and other small fruits, can not only be speeded up to an appreciable degree by the use of

Conveniences for the Berry Picker That Eliminate a Considerable Amount of Lost Motion, Making It Possible to Harvest More Fruit with Less Exertion

the simple ideas illustrated, but the work may also be made easier. Three wire brackets, of the type shown, are slipped behind the picker's belt and serve to carry several nested boxes; this makes it possible for the picker to carry several empty boxes so that the fruit can be sorted while picking. As the baskets are filled they are removed and left on the ground, and later collected in the double-decked tray, which is carried suspended from the neck. When picking, an aluminum drinking cup may be held in each hand so that the thumb and first two fingers are free to pick the berries and drop them into the cup, thus saving time by the elimination of much waste motion.—G. M. Beerbower, Tarrytown, N. Y.

Restoring Color to Tan Shoes

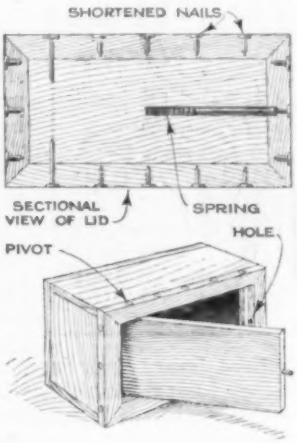
It often happens that tan and brown-colored shoes, after considerable polishing and wear, take on the appearance of black. When this happens, the shoes can be made to show some of their original color by removing all the old polish. This is done by rubbing them with a gasoline-soaked cloth. After allowing the gasoline to evaporate completely, the shoes are polished in the usual way.—A. C. Cole, Chicago, Ill.

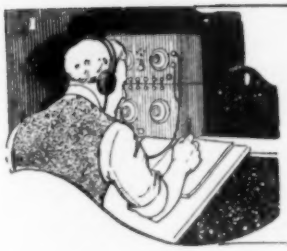
Releaser for Parachutes

It is a simple matter to attach a parachute to a kite and release it after the kite is in the air. The simplest method is to soak a piece of loosely woven string in a saturated solution of saltpeter and let it dry. This prepared string is used as a slow-burning fuse. The parachute is attached to the kite or kite string with a length of the prepared string, in such a manner that when the latter is burned up, the parachute will be released. Similarly, the shutter of a camera can be opened, by arranging the trip lever so that it will be pulled by a rubber band when the string burns down.—E. J. Bachman, Fullerton, Pa.

A Secret Box Lid

A simple secret box lid, that is proof against being opened by anyone who does not know the secret, is made by pivoting the lid, near one end, by means of two nails driven through the sides of the box into the edges of the cover. A hole is drilled in the middle of the opposite end of the lid to take a spring and a nail from which the point and head have been cut. When the lid is closed, the nail is pushed into a hole drilled in the end of the box, locking it securely. To open the box, it is necessary to push the bolt out of the hole in the box by inserting a heavy pin through a small hole, which leads from the outside to the nail socket, and by pressing down on the short end of the lid. The lid can be given the appearance of being solidly nailed by using shortened nails, and some other side may be made to appear as the cover. A shortened nail can be pushed into the small hole leading to the bolt, and, when in position, will conceal this perfectly. Some kind of mark should be made on the head of this nail, to distinguish it from the corresponding one on the opposite end.—Frank Presnell, Chillicothe, Ohio.



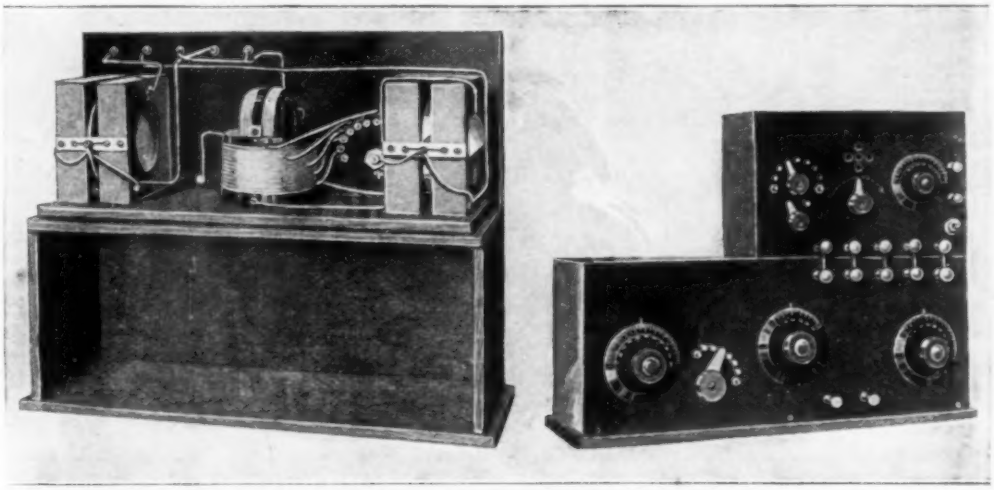


A SHORT-WAVE RADIO-TELEPHONE RECEIVER

By F. L. BRITTIN

THE radio-telephone receiver described in this article is of high efficiency, is very easy to build, and can be made for about one-third the cost of similar instruments now on the market. It has a normal telephone receiving range of about 300 miles, although under exceptional conditions up to 400 miles can be reached; telegraph messages can be heard over a distance of 1,500 miles. Its wave-length range is from 150 to 400 meters, thus making it possible to receive the market reports, news items, children's-hour stories, and concerts now being broadcast from many points over the country by government and commercial stations. A broadcasting station at Pittsburgh, and the radiophone stations at Madison, Wis., have been heard in Chicago with this instrument, using but one tube. With two steps of amplification, it is possible to use a loud talker, enabling speech and music to be heard clearly throughout a large room.

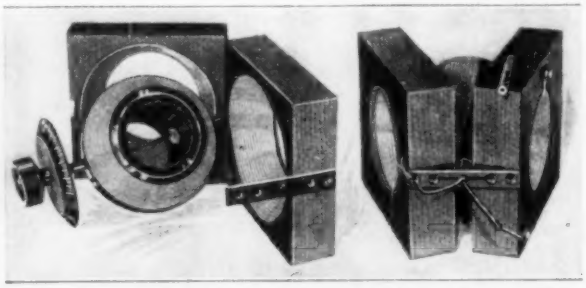
The completed instrument is in two parts, a lower cabinet, containing the tuning instrument, and a smaller one mounted on top, containing the detector unit. The latter need not be placed in a cabinet, but may be mounted as shown in the full-page drawing, thus allowing easy access to the circuit, and also permitting the builder to add one or two steps of amplification at any time and inclose the whole unit in one cabinet. The full-page illustration shows complete rear views of the tuner and detector, and also a front elevation of the completed instrument. It will be seen that the binding posts marked from 1 to 5 are placed on each panel so that, when the instrument is assembled, post No. 1 on the detector is directly over post No. 1 on the tuner, and the others in corresponding positions. The panels for both units are of 3/16-in. bakelite; that for the tuner is 18 in. long by 7 in. wide, and the detector panel 10 in. long by 7 in. wide. Templates for both these panels are shown in the full-page illustration also; the full-size outline of the panels, together with the location of the various holes, should be laid out on a piece of cardboard, the cardboard cut to size, the holes drilled in the proper positions, and the templates used to mark the panels.



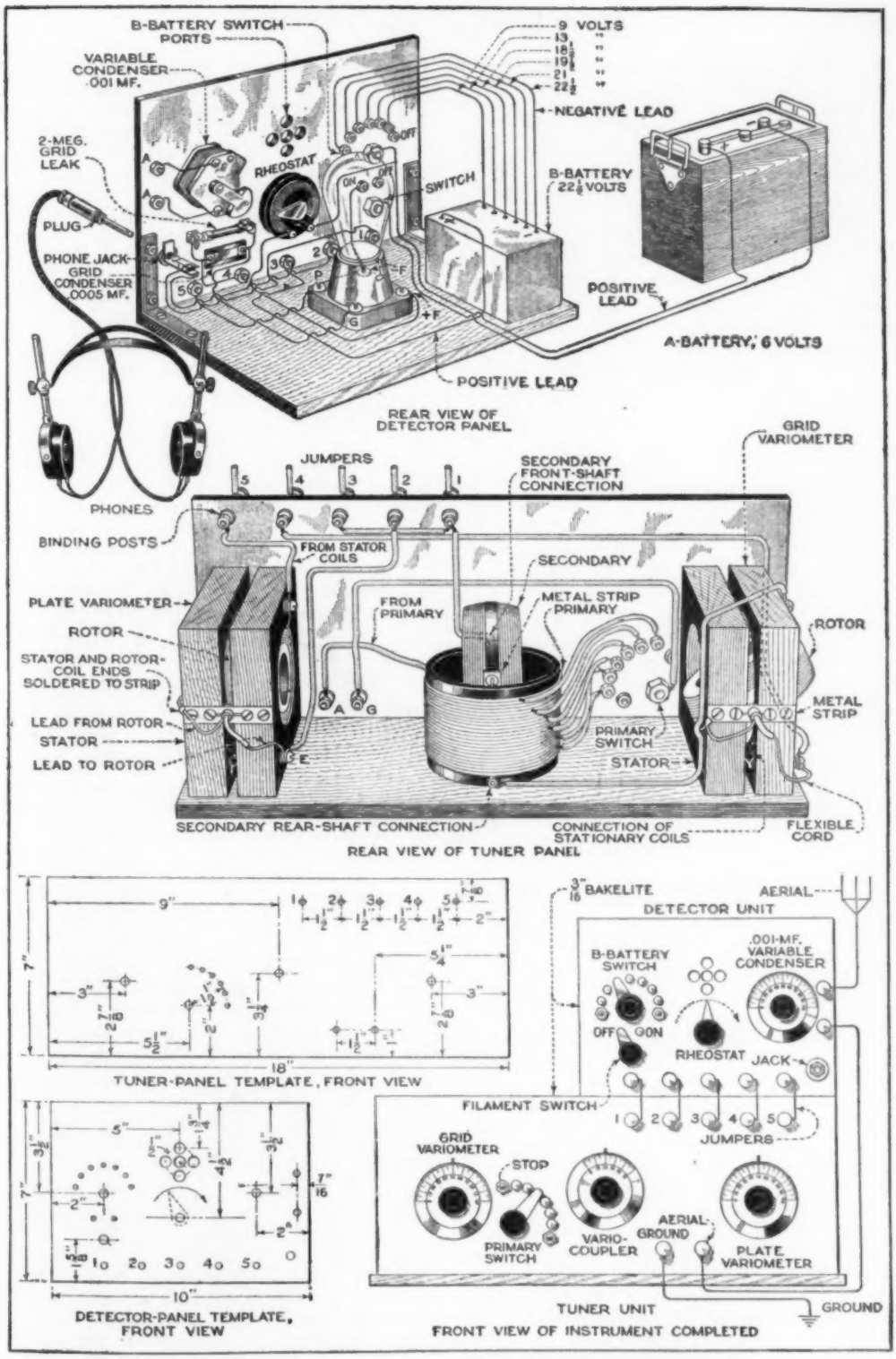
Left: Rear View of Tuner, with Its Cabinet; Right: Complete Instrument. Note How the Binding Posts on Each Unit are Connected by Insulated Jumpers. The Use of a Cabinet for the Detector Is Optional

The plate and grid variometers and the variocoupler are built up from knocked-down parts, obtainable from any radio-supply house. These parts may be had with or without windings. Those who

wish to wind their own coils and mount their own units should secure the necessary unwound forms, two stationary forms, measuring 1¼ by 4¾ in. square, and a rotor ball, 4 in. in diameter by 3 in. thick, being necessary for each variometer, and a rotor ball and bakelite tube for the variocoupler. Each stationary form, or stator half, is hollowed out to take the stationary windings, in such a manner as to allow the rotor ball, with its windings, to be revolved inside the stator without touching the stationary coils, although they must be as close together as possible. The distance between the rotor and stator coils can be adjusted by means of the metal-strip bearings shown on each variometer. Each stationary coil of the variometer is composed of 30 turns of No. 20 single cotton-covered magnet wire. These windings are first wound on a ball form, supplied with the variometers; the coil seat in the stator half is coated with shellac, and the ball form carrying the winding is then forced against the seat and clamped or weighted; when the shellac has dried, the ball form may be withdrawn, leaving the coils in place. These coils are wound clockwise and are joined together between the halves of the stator, near the rear, as shown in the rear view of the tuner panel, and also in the winding detail and connections of the variometers. The outside lead of one coil is brought out to a screw on the side of the stator, the outside lead of the other coil being soldered to a corner of the rear bearing strip connecting the stator halves. The rotor coils are wound with 54 turns of No. 20 single cotton-covered magnet wire, 27 turns on each side of the ball. These coils are wound counterclockwise, the connections between the windings being made on the inside of the ball, as indicated in the winding detail, and the wire passed to the inside of the ball through small holes drilled for that purpose. The outside leads are threaded through small holes running from the edges of the ball to the center, and are then soldered to flexible leads. The rear shaft of the rotor is 2⅛ in. long, is made of ¼-in. rod, either brass or iron, threaded for 1⅛ in., and has a ⅛-in. hole drilled through it, along its axis. A hole a little smaller than the diameter of the shaft is drilled through the ball, the shaft screwed into the hole tightly, and locked with a nut on the inside of the ball. The front shaft is a piece of ¼-in. brass or iron rod, threaded for half its length, and screwed into a hole directly opposite the tubular shaft. One of the flexible leads of the rotor coils is inserted into small rubber or "spaghetti" tubing and both leads brought through the rear shaft, one being soldered to the bearing strip, and the other led to the bottom screw on the stator. These flexible leads are made of small "litzendraht" wire; this is easily obtainable. Both variometers are built and wound exactly alike. The variocoupler is also made up of two separate units, the primary being wound on a bakelite tube, 2½ in. high and 3½ in. outside diameter, with a wall thickness of 1/16 in.; 37 turns of No. 20 single cotton-covered magnet wire are wound on this tube, and six taps are taken off, beginning with the first turn at the bottom, and spacing the taps equally to the top turn; the taps should be staggered, as shown in the rear view of the tuner panel, carefully soldered, and be led to the contact points on the primary switch on the panel. The lever of this switch is connected to the ground post, and the top end of the coil to the aerial post. The end of the first turn, at the bottom, is passed through a hole drilled in the tube, and clinched to hold the winding firmly. The top turn of the primary winding is clinched in the same manner, before being led to the binding post. The secondary is wound on a rotor ball similar to that used for the variometer, but 3⅛ in. in diameter and 1¾ in. wide. Each coil is composed of 16 turns of No. 26 single cotton-covered magnet wire, the coils being wound so that the current will flow in the same direction in each; the connection between the coils is made in the same way as on the variometer balls, but one of the outside leads of the rotor winding is connected to the front shaft,



Variometer Wound and Partly Assembled: The Right-Hand View Shows How the Rotor Leads are Brought through the Rear Shaft. One of the Tubular Shafts is Shown on Top of the Stator

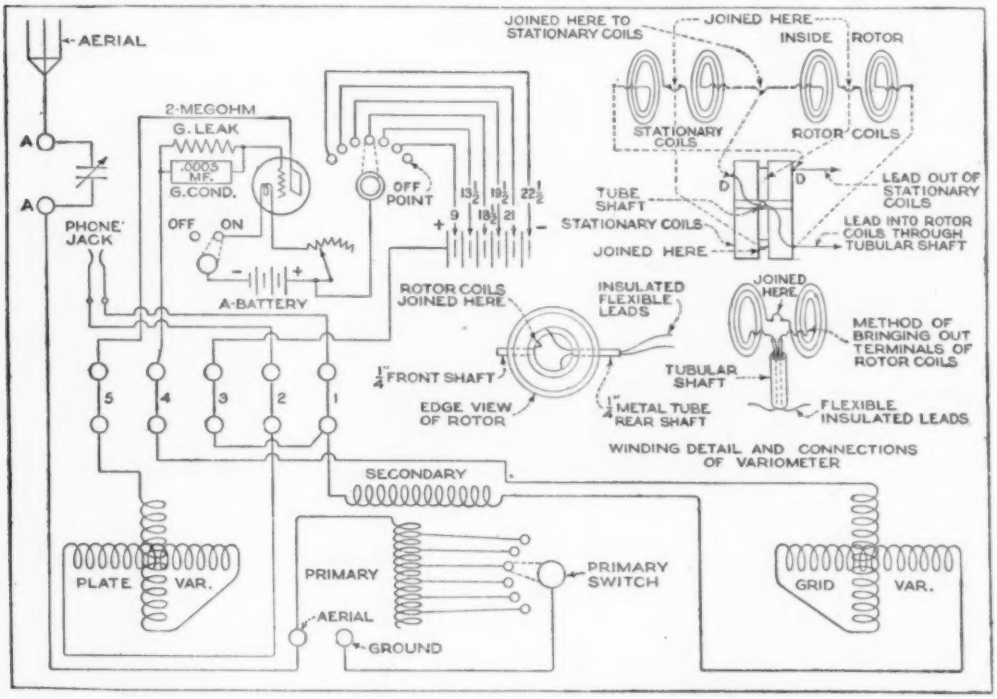


Rear View of Detector and Tuner Units, Layout of Panel Templates, and Front Elevation of Complete Instrument: The Design Is Such That a One or Two-Step Amplifier may be Added at Any Time, Using the Same Tuner and Detector. The Amplifier should be Built to Fit on Top of the Tuner Cabinet, beside the Detector

inside of the ball, and the other to the rear shaft. These shafts are ¼ by 2 in. for the front shaft, and ¼ by 1½ in. for the rear shaft. The shafts are supported by bearings, in the form of metal strips, 1/16 by ½ by 3 in., drilled for the shaft, placed upright in the primary tube at the front and rear, and secured to it by small machine screws at top and bottom; the holes for the shafts should be drilled of such a size that the secondary coil will not rotate too freely, and the front and rear shafts should be connected to the bearings by soldered "pigtails" made of flexible litzendraht wire, to insure a good electrical connection. A lead from the front bearing is connected to post No. 1 on the panel, and a lead taken from the bottom of the rear bearing is connected to the screw that also carries the lead from the stationary coil of the grid variometer. The cabinet for the tuner unit is made of basswood, or other easily worked wood. The dimensions are as follows: for the sides, ⅜ by 6½ by 6½ in.; for the top, ⅜ by 6½ by 17⅝ in.; the base, ½ by 6¾ by 18½ in., and for the back ⅜ by 6⅞ by 17⅝ inches.

The tuner circuit is very clearly illustrated in the rear view of the tuner panel as well as in the circuit diagram. All connections are made with No. 18 tinned-copper wire, covered with spaghetti tubing, although any good insulated wire of this size will do. All connections in the circuit must be thoroughly soldered. When the units have been mounted, the tuner unit is complete, with the exception of the variometer dials, which read to 100°, and the variocoupler dial, which reads to 50 degrees.

At the top of the full-page illustration may be seen the full details and connections of the detector unit. The panel is mounted on a wood base, measuring ⅜ by 6¼ by 10 in., and is held in an upright position by means of two small metal brackets. The ports drilled in the panel are for the purpose of observing the brilliancy of the filament in the detector tube. Directly below these ports the rheostat is mounted. This is an ordinary battery rheostat, made for panel mounting. The detector-tube socket, of the bayonet type, is placed on the exact center of the wooden base. The detector tube used is a soft or gas-filled tube. The B-battery is a standard 22½-volt unit, tapped off in steps, the leads being brought out to the B-battery switch on the panel. This switch is necessary to control the voltage, as all tubes do not take the same poten-



Complete Circuit Diagram and Connection Details of the Variometers: The Latter Show the Connections Only, and No Attempt has been Made to Show the Direction of the Coil Windings

tial. The A-battery is an ordinary six-volt 40 ampere-hour auto lighting battery; four dry cells may be used here, but the storage battery is recommended as it is more economical. If the builder wishes to make his own fixed or grid condenser, it may be made of two sheets of tinfoil, measuring 2 by 2 in., mounted alternately with three sheets of mica, measuring 2¼ by 2¼ in. These, however, can be purchased in the market for about 35 cents. The grid leak is of 2 megohms' resistance, is of standard make, and is connected around the grid condenser as shown in the drawing. The variable condenser mounted just above the grid leak is also of standard make, arranged for panel mounting; it has 43 plates, and a capacity of .001 mf. This condenser is connected to the binding posts marked A. A lead from the lower binding post A goes to the aerial post on the tuner unit, and that from the upper post A to the aerial proper, as shown in the circuit diagram. The phone jack is of the ordinary one-way type, and binding posts can be used here instead of the plug and jack, if desired. The on-and-off switch is used for cutting out the filament current when the set is not in use. The switch lever on the B-battery switch should also be kept on the off point when not using the instrument. This circuit is also wired with No. 18 wire and all connections soldered. The B-battery can be placed on the base of the detector unit, as shown in the drawing, and the A-battery placed underneath the operator's table, the leads being brought up to binding posts arranged at the rear of the panel or base, as desired. The phones used are of standard make and should be of 2,000 ohms' resistance.

The aerial used with this instrument is No. 14 bare copper wire, it should be at least 75 ft. long, and should be strung up 30 ft. from the ground, insulated at each end by porcelain cleats or standard aerial insulators, and brought down to the receiving instrument through a standard 100-ampere grounding switch, placed on the exterior of the building. The lead from the aerial is connected to the middle clip on the switch. The upper post marked A on the detector or panel is connected to the upper switch clip by No. 14 insulated wire, and the lower clip is connected by a lead made of No. 4 insulated wire to a 6 or 7-ft. iron rod driven into the ground on the outside of the building. All connections must be carefully soldered. The No. 14 wire lead running to the instrument from the grounding switch should be led into the house through a porcelain tube. When installed in this manner, and the grounding-switch lever is thrown down when the set is not in use, the installation conforms to all the requirements of the fire-insurance underwriters; the aerial acts as a lightning rod, and is a protection rather than a source of danger to the building. It is advisable to place the instrument as near the aerial lead as possible. The ground lead from the instrument is connected to a near-by water pipe, steam or hot-water radiator pipe, or to a ground rod in the basement; connections to a pipe may be made by filing the pipe bright, and soldering the end of the lead to a ground clamp, which can be obtained at any electrical-supply store. It is a good plan to connect a switch between the A-battery and the detector panel, so that the battery can be cut out when not in use, as some one unfamiliar with the set may forget to turn the panel switch off.

To operate the set, place the phones on the head, push in the phone plug, see that all resistance is in on the rheostat, put the switches on the "on" points, and it will be noted that the filament in the tube is lit; turn the B-battery switch up to the 18½-volt contact point, and then turn the rheostat until a hiss is heard in the phones. Turn the rheostat back until the hiss just disappears; this is the operating point of the tube. In some cases it is necessary to use the whole 22½ volts on the tube, but this can only be determined by trial. Signals, on some wave length, will now probably be heard, if so, adjust the variable condenser until they are at their loudest.

The primary switch of the variocoupler is so constructed that, when turned from left to right, the instrument tunes from 150 to 400 meters. The secondary is adjusted by means of the knob and dial on the panel. Some variometers work better when turned to the right, some when turned to the left, depending upon the characteristics of the set, so the final adjustment of the dials on the panels will depend upon this. The dials should be so placed on the shaft that the zero points will stand at the index marks on the panel when the rotors are vertical.

If one is tuning to 360 meters—the wave length of the broadcasting stations—it will probably be found that nearly all of the primary of the variocoupler will be in the circuit, and that the dials of the variometers have been turned through an arc of about 80°. These adjustments take a little practice and patience, but the operator will soon find the knack. The

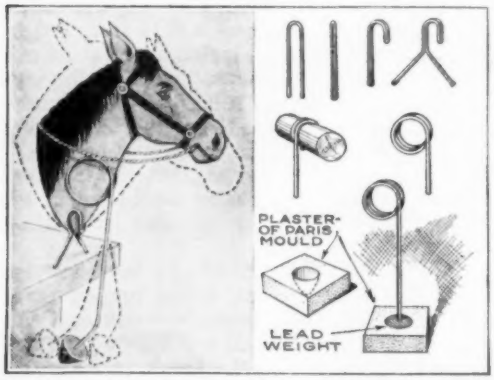
cost of building this instrument, as similar sets are marketed, without batteries, phones, aerial, or detector tube, is about $27.60 at current prices. The total cost, including aerial wire and insulators, grounding switch, batteries, phones, and tube, is about $45, using four dry cells for the A-battery. If a storage battery is desired, a good 6-volt 40 ampere-hour battery can be had as low as $11. These prices are for first-class materials, which are necessary for good results.

MATERIAL LIST

1 piece of wood, 3/8 by 6¼ by 10 in.
1 bakelite panel, 3/16 by 7 by 10 in.
1 bakelite panel, 3/16 by 7 by 18 in.
1 piece of wood, ½ by 6¾ by 18½ in.
1 piece of wood, 3/8 by 6⅞ by 17⅝ in.
1 piece of wood, 3/8 by 6½ by 17⅝ in.
2 pieces of wood, 3/8 by 6½ by 6½ in.
1 pair phones, 2,000 ohms' resistance.
1 variocoupler complete, knocked down, with or without windings.
2 variometers complete, knocked down, with or without windings.
2 variometer dials, reading 0 to 100.
1 variocoupler dial, reading 0 to 50.
1 V.T. socket.
1 V.T. detector tube, soft.
1 battery rheostat for filament control.
1 standard 100-ampere grounding switch.
1 .001-mf. variable condenser, complete with dial (panel-mounting type).
1 .0005-mf. grid condenser.
1 standard 2-megohm grid leak.
1 phone jack, one-way type, open circuit.
1 phone plug.
15 contact points.
3 switch levers.
14 binding posts (preferably with black-rubber knobs).
1 22½-volt B-battery unit, tapped-off type.
1 6-volt A-battery, storage battery preferred.
6 switch stops.
15 nickelplated round-head wood screws, 1 in. long.
4 flat-head screws, 1½ in. long, for attaching sides of cabinet to base.
No. 18 insulated copper wire for circuit.
No. 14 bare copper wire for aerial.

Making a "Kiddie Horse"

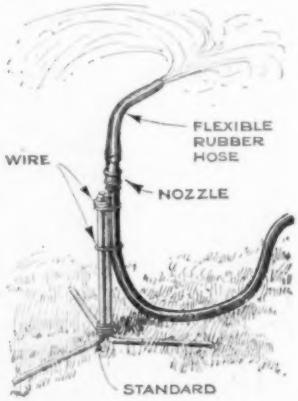
A toy for the amusement of the children, that costs little or nothing, and that is practically indestructible, can be made from a piece of cardboard, some pieces of wire, and a small piece of lead. A horse's head or other figure is painted on stiff cardboard, and then cut out, although a suitable picture pasted on cardboard and cut out, will answer as well. The cardboard figure is balanced on the edge of a mantelpiece or table by the "legs," or pivot, formed from wire. A somewhat longer piece of wire is bent at one end to clip over the card in the manner of a paper clip, and a lead weight is cast onto the opposite end, in the following manner: A cavity is made in a block of plaster of Paris, or wood, and after the end of the wire is inserted, the opening is filled with melted lead. The pivot and weight are fastened to the horse's head in the manner illustrated. A slight push will serve to start the head wagging, and it will be several minutes before the figure comes to rest.—Adolph F. Lonk, Chicago, Illinois.



A Simple Toy for the Children is Pivoted on the Edge of a Mantel or Table. Once Set in Motion, the Figure will Continue to Rock for Several Minutes

A Simple Lawn Sprinkler

Funds not being available for the purchase of whirling lawn sprinklers, the custodian of a public building overcame the lack by making sprinklers of his own that were effective and practically costless. A standard of wire was made, and the nozzle end of the hose was fastened to the perpendicular part of the standard. An 18-in. length of 3/8-in. flexible rubber hose was wired over the end of the nozzle and the water turned on. In operation, the pressure of the water seeking escape through the narrow aperture of the nozzle and hose, causes the latter to thrash about, scattering water in all directions.

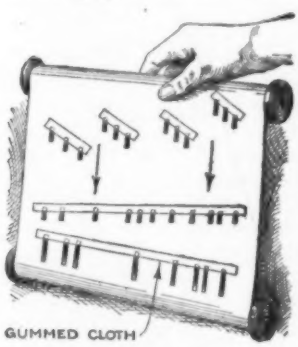


Restoring Typewriter Ribbons

Typewriter ribbons that have been used to such an extent that they produce only a weak impression, can be given additional life by a simple method. Remove the ribbon and spool from the machine, and holding it in one hand, saturate it with alcohol or gasoline. Then pull the free end of the ribbon, while holding the spool tightly, thus causing the coils to compress and force the solvent through the ribbon. The ribbon is then placed in a warm place for about 12 hours, or until thoroughly dry.—Werner W. Baumeister, Cambridge, Massachusetts.

Repairing Player-Piano Rolls

At certain places on player-piano rolls the roll has a tendency to buckle or move slightly to one side, this being specially noticeable on rolls that have been used for some time. This is due to the fact that there are a large number of holes at that point or that the holes are so placed as to weaken the paper. Continued use of the rolls aggravates this condition as the paper becomes soft and warm. A good way to prevent this is to paste a piece of gummed cloth on the roll, keeping as close as possible to the holes without covering them. In some cases this is impossible, owing to the position of the holes. Then, a portion of the holes may be covered, taking care always to cover the back end of the openings, that is, the portion of the holes which is last to pass over the tracker board. The leading end of the holes should never be covered as that will cause the notes to be played slightly late, and to cover the center of the holes will cause two short notes to be played instead of a single long one. By covering the back end of the holes, the notes are merely shortened a trifle; this will not be found objectionable, and, in fact, may even be desirable in some cases, as the music becomes more "snappy." The gummed cloth should be placed on the side of the paper that shows while in operation.—R. H. Kasper, Philadelphia, Pa.



A Double-Action Garden Hoe

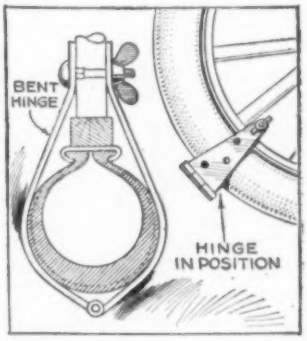
By cutting out a portion from the center of the blade of a hoe and pointing the projection on each side, an ordinary hoe is converted into a tool that permits cultivating on both sides of a row of seedlings at the same time, thus minimizing the time and effort used.

A Fork-Shaped Hoe, Made from the Standard Garden Hoe, Makes It Possible to Save Time by Working on Both Sides of a Row of Seedlings at the Same Time

The blade is cut along the dotted lines, as shown in the drawing, with a cold chisel, and the rough edges are afterward smoothed down by filing or grinding. The implement is used as illustrated, and will be found quite effective for cutting small weeds and loosening up the soil around the roots of the plants.—Gregor H. Glitzke, Kansas City, Mo.

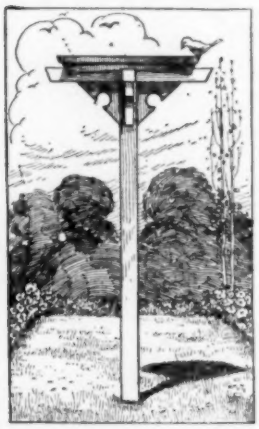
Auto Mudhooks Made from Hinges

Strap hinges of a familiar type can be made into very satisfactory mudhooks for the extrication of a car from mud or sand. However, the hinges should be of rather large size, for they must be bent, as shown in the drawing, so that the ends are in a line inside the wheel rim. The mudhook thus formed is clamped to the wheel by a bolt and wing-nut.



A Bird Bath of Simple Design

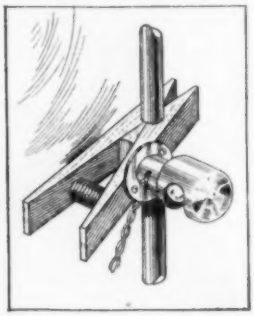
No garden can be considered quite complete without a bird bath of some sort, and it need not be an elaborate or expensive affair of concrete or stone to attract the birds, who are more appreciative of the water than of the container.



The drawing shows a simple design for a bird bath that can be executed at minimum expense of time and cost of material. A suitable length of 2 by 2-in. stock is used for the upright support, which is driven into the ground. An earthenware dish, such as flowerpots are set in, preferably one about 16 in. in diameter and about 2 in. deep, is used as a container for the water. Four horizontal arms, each 1 ft. long and 1½ in. square, are fastened to the sides of the support to bear the dish. These arms are mortised, to make an opening into which the dish is inserted and which prevents it from being accidentally pushed off. Simple brackets underneath the projecting supports can be used to add to the appearance and solidity of the completed bath.—Leo Rosasco, Indianapolis, Ind.

Trouble Lamp Mounted on a Clothespin

An arrangement by means of which an inexpensive dash lamp can be made into a convenient trouble lamp, that occupies little space in the tool box, requires nothing more than a spring clothespin.



The lamp socket is fastened to the clothespin and provided with a suitable extension cord and plug. The use of the clothespin permits the lamp to be clipped to many parts of the car, and thus both hands are left free.—J. G. Brown, Evanston, Ill.

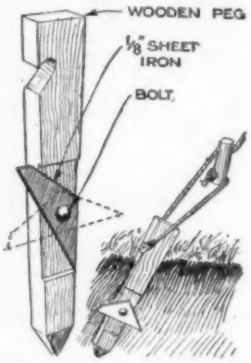
Unusual Fish Bait

A Pacific-coast fisherman has devised an original and successful method of catching salt-water fish. A wide-mouthed, clear-glass bottle is used after the bottom has been removed. A cork, to which a pair of hooks is attached to hold the minnows that constitute the bait, is fitted into the mouth of the bottle. Wire rings around the bottle at two places have a series of hooks attached to them, the rings being held the proper distance apart by wires which terminate in a loop over the cork; the entire bait is attached to the line with a swivel to prevent twisting.

With the bottom of the bottle removed the weight is diminished when it is being pulled out, and although the bait is quite effective, due to the transparency of the glass, the fish is prevented from getting anything but a hook on the outside of the bottle.—C. C. Wagner, Redondo Beach, Calif.

An Improved Tent Peg

Many different ideas have been applied to making a tent peg that will not pull out of the ground, but the one illustrated has the merit of using the cheap and easily obtained wooden pegs with a simple attachment that prevents them from being pulled out by accident.



A mortise is cut on one side of the peg to accommodate a triangular piece of sheet iron, pivoted to swing freely. The pegs are driven in the usual manner, but when any undue strain comes on the tent ropes, the sheet-iron piece assumes the position indicated by the dotted lines and locks it as securely as the character of the soil will permit.

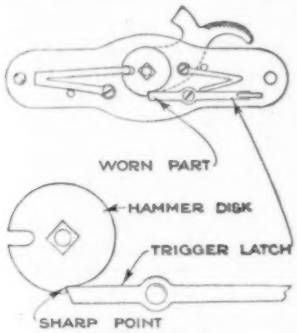
Cooling Breezes from the Vacuum Cleaner

The ordinary suction cleaner can be used to cool the temperature of a room without alteration of any sort. Simply place the cleaner over one of the hot-air registers and remove the dust bag. Be sure that the fresh-air intake pipe from

the outside of the furnace is open. If there are no furnace registers, the same effect can be obtained by setting the cleaner near a door or window. In either case see that the nozzle of the machine is raised slightly from the floor so as to allow free suction of air. When the current is turned on, a strong blast of air will be delivered through the dust-bag opening.—Chas. J. LeCompte, St. Louis, Missouri.

Repairing Gun Locks

After a double-barreled shotgun has been used for a long time, trouble is often experienced in keeping the hammers cocked — they occasionally snap off apparently without cause, and make the use of the gun exceedingly dangerous. This trouble is caused by the wearing of the point of the trigger latch, as shown in the drawing. An accumulation of dirt in the notch of the hammer disk will also prevent the latch from getting a good hold. The remedy for both troubles is simple. Remove the side plate of the gun, take off the trigger latch, and with a fine file bevel off the end of the latch, removing as little metal as possible. After cleaning out the notch in the disk and giving it a light coat of vaseline, the lock is reassembled.



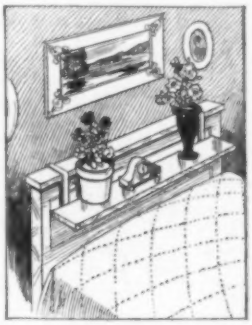
Preventing Use of Hose Faucet

Many persons try to prevent meddling with hose faucets by removing the little T-head keys by which they are turned. This kink almost always results in the stem of the faucet being rounded off by the application of pliers and other tools.

A more effective preventive, and one that is free from this drawback, is the application of a ¾-in. pipe cap over the threaded end. The cap can easily be screwed on with a pair of pliers, or even by hand, to prevent the meddling of children. This is also an excellent method of stopping dripping faucets until new washers can be fitted.—Doncaster G. Humm, Phoenix, Ariz.

Bedstead Shelf for the Sick Room

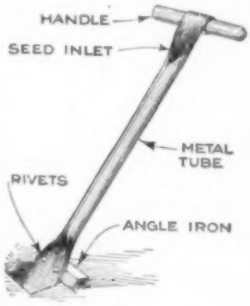
The days in a sick room are monotonous and soon make the patient nervous and fretful; a note of cheerfulness and variety, however, may be introduced by making a shelf to hook over the foot of the bed, on which fresh flowers, pictures, or other articles can be placed. The same shelf can be used with any style of bedstead, whether of wood or metal. Two iron hooks and a narrow board are the only parts required. Articles suggestive of the patient's condition, such as medicine bottles and the like, should not be placed on this shelf, but kept out of sight as much as possible.—Robert H. Neill, Ottawa, Ohio.



A Simple Seeder

When dropping seed in the corn hills, or planting the pumpkin or the melon patch, the stooping that is necessary in order to drop the seeds in the proper place makes the job somewhat fatiguing. So, to make such work easier as well as simpler, the seeder in the drawing was devised.

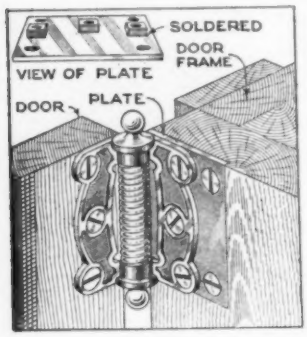
A piece of thin tubing, about ¾ in. in diameter and 4 ft. long, was split at each end for several inches, and the split portions flattened out; one end was bent around a piece of an old broom handle; the opposite end was sharpened, and about 3 in. from the point, a short piece of light angle iron was riveted to the back to serve as a foot step for forcing the tool into the earth. As this step is in a fixed position, the seeds can be planted to a uniform depth.



To operate this seeder, it is forced into the ground, and the seeds are dropped through the opening at the top and fall into the cavity made by pushing the tool forward. By placing the foot in front of the blade, as it is withdrawn from the earth, the seeds are held and covered.

Permanent Screen-Door Fastenings

The necessity of using larger screws or plugging worn screw holes every year, when the screen doors are put up, can be overcome by adopting the idea illustrated. A small iron plate is fastened to the door frame with four screws; this is a permanent fixture. Before fastening the plate in position, holes are drilled through it which coincide with those of the hinge. On the reverse side of the plate, and exactly over the holes, nuts are soldered. Flat-head screws are then run through the holes in the hinge of the screen door to take the place of the ordinary wood screws. The wood underneath the nuts is countersunk with a drill so that the plate will come flush with the door frame.



Faucet Guard for Dishwashing

Part of a rubber ball was used by a householder to prevent dishes from being nicked and broken by contact with the faucet, while washing them in the sink. The ball was cut in two, and a hole, a little smaller than the diameter of the faucet spout, cut in the cup thus formed. The cup was then forced over the faucet in the manner shown, and held in place by adhesive tape.—Truman R. Hart, Ashtabula, Ohio.

Swimming under Water

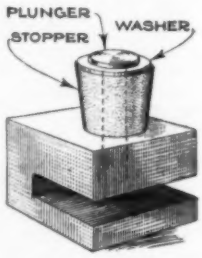
The following instructions, when carefully followed, will enable any normal person, who can swim, practically to double the length of time he can remain under the water. The usual method of nearly all swimmers is to take the deepest breath possible before plunging; they generally swim in a haphazard way, and come to the top just as soon as they think they are getting out of breath.

To break one's own record, one should observe the following rules: First, take several deep breaths, and then blow every particle of air out of the lungs, instantly draw in a full, deep breath, and then dive, going down deeper than usual; second, take regular strokes, about one a second, and always try to go one stroke farther than in the last dive. By counting the number of strokes taken under the water, the swimmer's confidence is wonderfully increased, and he also is able accurately to judge his location at all times.

The ability of a person to remain under water can be tested on land by practicing the above method and timing himself with a watch. This is the method used by most professional swimmers.—Carroll Pfleegor, Milton, Pa.

Rubber Stopper Used as Spring

A small punch, used for punching holes in the leaves of a loose-leaf ledger, was repaired in a simple manner when the spring that returned the plunger became broken. In order to make the punch serviceable until a new spring could be obtained, a rubber stopper was used. A hole, a little larger in diameter than the punch, was drilled through the center of the stopper and the latter inserted into the tool opening in place of the spring. Then, after a washer had been placed underneath the head of the punch, it was inserted through the hole in the stopper. When the plunger was forced down, it was automatically restored to position as soon as the pressure had been released.—Dale R. Van Horn, College View, Neb.



Drying Yellow Poplar

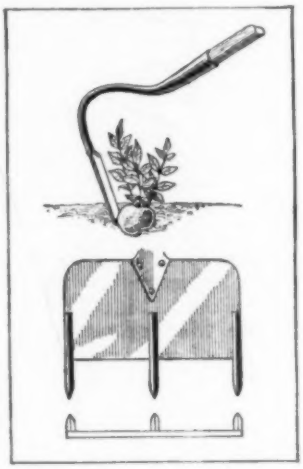
Yellow poplar lumber, fresh from the saw, can be dried quickly and the danger of staining reduced to a minimum by piling the boards on end. The object of this is to permit the moisture to drain off freely and improve the circulation of air around the boards. Lumber dried in this manner will be bright and clean, and can be shipped after a few weeks.

Planting Corn

It is much better to plant four rows of sweet corn 5 ft. long side by side than it is to plant one row 20 ft. long with as many plants. The former method will produce more and better corn than the latter, because there will be a better distribution of the fertilizing pollen, as, the rows being closer together, the wind will carry it between the rows. In a long single row, the greater portion of the pollen will be blown away without falling upon the silk to fertilize it and produce the corn. Each silk fertilized means more kernels of corn on the cob, and failure of proper fertilization causes bare spots upon them.

Guard Prevents Dulling of Hoe

Gardeners, amateur and professional, often damage or ruin the edge of their nicely sharpened hoe by striking a concealed rock. In order to prevent this, at least to a great extent, the guard illustrated may be used with good effect. It consists simply of three narrow blades, attached to the face of the hoe, with the points extending about ½ in. beyond the edge of the implement.



The blades are made of stock heavier than the hoe, and the end and faces are sharpened. If large stones are encountered, the points of the blades take the bump, and even though they become dull, they do not prevent the hoe from entering the ground easily. To make a smooth job, the blades should be welded to the hoe.

Skate Aids in Moving Furniture

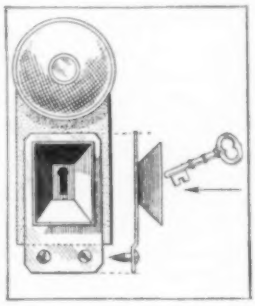
Having occasion to move a heavy display table from one end of the store to the other, a distance of about 70 ft., without help, I placed a roller skate under each of the legs at one end, and thus rolled the table along to its new position easily.—H. B. Nissly, Sioux Falls, S. D.

A Carrier for Cork Auto Gaskets

The flimsy cork gaskets used underneath the various cover plates and about practically every detachable part of an automobile engine, are difficult to handle without breaking, which makes them practically unfit for use. To minimize the danger of breakage, and consequent loss, a serviceable but simple carrier can be made that not only protects the gaskets but keeps them always visible, so that the mechanic can select any one of them without delay. This carrier is made from the back curtain of an old automobile top, containing a square or rectangular celluloid light. The material is sewed over the light to form an envelope, into which one or more sets of the gaskets can be placed, and as the carrier can be dropped and otherwise mishandled with small risk of damage to its contents, the saving will rapidly pay for the trouble involved in making it.

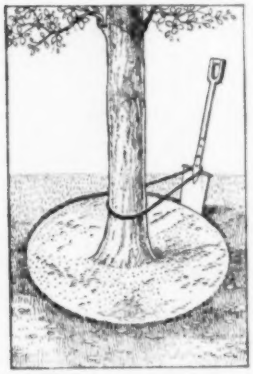
Key Guide for the Back Door

By means of the key guide shown in the drawing, one can locate the keyhole in the darkest night as easily as during the day. The entire device is made from sheet metal. Four strips, each about 1 in. wide, are formed into a flared frame and soldered over a square opening cut out of a flat strip of the same material; this should be a trifle wider than the guide proper. In use, the attachment is fastened to the door with two screws, so that the keyhole comes in the center of the square hole. As the key is inserted into the guide, the tapering sides cause it to be directed toward the keyhole.



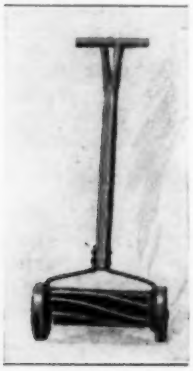
Cutting Sod around Trees

To cut the sod from around the trunks of trees, and at the same time form a circle, is a little more difficult than is generally realized. However, by the method shown in the drawing it is possible to describe a circle and cut the sod at the same time. A loop of rope is tied around the tree and the spade is inserted into the opposite end. A circle of any desired diameter may be obtained by increasing or diminishing the radius, represented by the length of the loop of rope.—Doris Johnson, Rockford, Ill.



A Strong Mower Handle

In the rare cases that the handle of a lawn mower becomes broken, another, as strong and serviceable as the original, can easily be made from a strip of oak of the same dimensions. The new handle is split down its center for about 14 in. at one end, and a ¼-in. bolt is inserted into a drilled hole about an inch below the bottom of the cut, and tightened, to prevent the piece from splitting. The split end is then steamed and the outer ends bent about 4 in. apart. A tenon on each of the bent parts is fitted into a corresponding mortise in the handle, which is made from a 14-in. piece of the same stock as the handle.

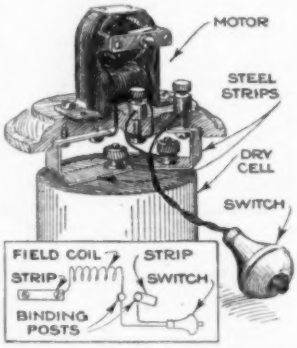


An Auto-Theft Alarm

State laws and municipal ordinances, in most cases, make it practically impossible to lock an automobile so that it is immovable, by chaining the wheels or locking the brakes. However, the use of alarms is not prohibited, and it is consequently possible to wire the horn of the car in such a manner that it will begin to blow as soon as the engine is started, and continue to do so as long as it is operating. This is accomplished by mounting a concealed switch underneath the cowl, which must be opened when the engine is started, and running a wire from the generator to the horn; this does not interfere with the usual operation of the horn from the button on the steering wheel. Consequently, with the engine stopped and the switch closed, the horn will commence to blow as soon as the generator begins to operate.

Simple Mounting for Small Motor

When using a small electric-battery motor for different experiments in the amateur's laboratory, it is generally found that the units, when connected in the usual manner, are awkward to move about. To combine the two, the motor is mounted on the top of the dry cell by means of two steel, brass, or copper strips, attached to the underside of the motor base, bent as shown, and clamped to the binding posts of the battery. A switch of the type illustrated, or of any other type desired, is connected to the binding posts on the base of the motor, so that the latter can be started and stopped as desired.—W. A. Saul, Cambridge, Mass.



The F-Numbers of Lenses

The F-numbers of photographic lenses, such as F/7.5 and F/6.3, etc., indicate the working aperture of the lens at which good definition is to be had, and hence the speed of the lens. The numbers themselves indicate the quotient resulting from division of the focal length by the diameter of the largest diaphragm opening. Thus, F/7.5 means that the diameter of the diaphragm opening is contained in the focal length 7.5 times; also, it may be seen that the smaller the number of any particular lens the larger the corresponding working aperture and the shorter the necessary exposure.

A Small Electrically Heated Steam Boiler

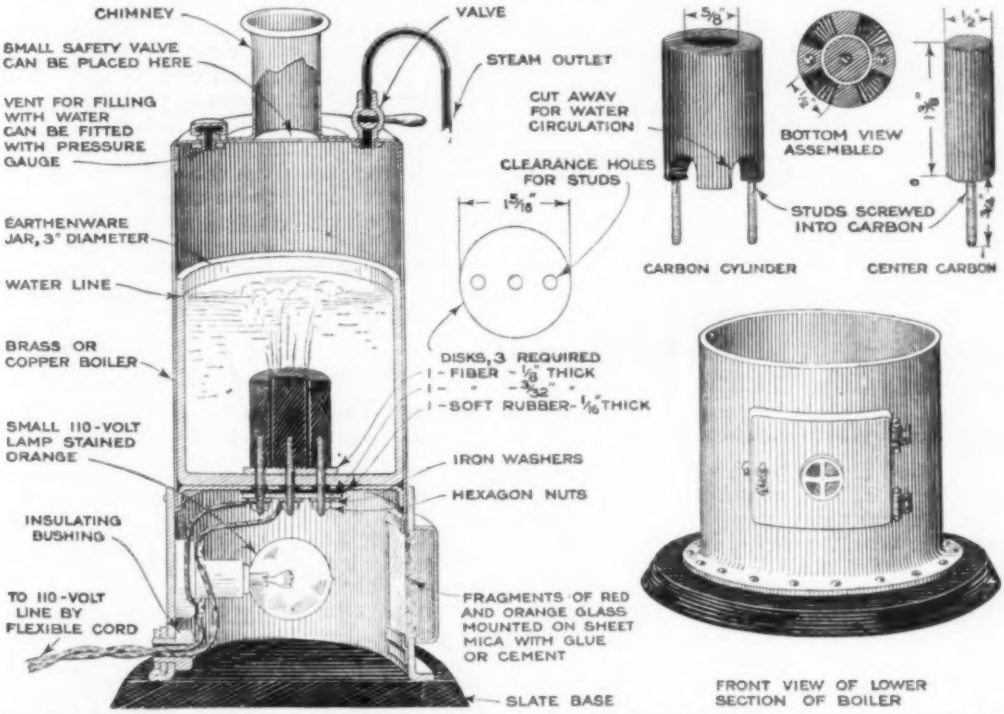
By A. N. CAPRON

A GREAT many amateur mechanics have frequent need of some apparatus that will supply steam under light pressure for the operation of model engines, turbines, and such incidental work as opening storage batteries; and it is for just such purposes that the electrically heated boiler shown in the drawing was designed.

First, an earthenware bottle, or jug, of the size required is obtained; this is cut off about 3½ in. from the base, the operation being easiest performed on an emery grinder. Two pieces of hard carbon are required, which are drilled and formed to the dimensions shown in the drawing, the bottom of the larger piece being cut away, as indicated, to permit free circulation of water around and through the heating element. Both carbon pieces are drilled to take brass studs which may be made by threading short lengths of 3/32-in. brass rod; these are screwed into the holes drilled for them, or they may be held by means of small metal pins.

The carbon heating elements are to be assembled together in the bottom of the earthenware cup so that there is 1/16 in. between them, and holes to accommodate the studs must be drilled through the bottom. This is accomplished by first chipping off the glaze and drilling the holes with a twist drill kept moistened with turpentine. The holes having been drilled, a boiler is made from sheet brass, copper, or iron to correspond with the dimensions of the earthenware jar, as shown in the drawing, with a horizontal support for the jar to rest upon.

This latter piece, which forms the top of the fire box, is drilled to give ample clearance for the studs and should be free from contact with them, as indicated. To prevent any possibility of the water or steam working its way between the earthenware jar and the boiler shell and out at the bottom, the seam should be silver-soldered, after the shell has been riveted in place, although brazing would be better. The heating element is then placed in position and insulated from the metal boiler with fiber disks, as indicated, a similar disk of soft rubber being used to prevent escape of steam or water. The top of the boiler is equipped with a steam valve, and the other necessary fittings, including a vent for filling the boiler, are brazed or riveted to the boiler shell. It



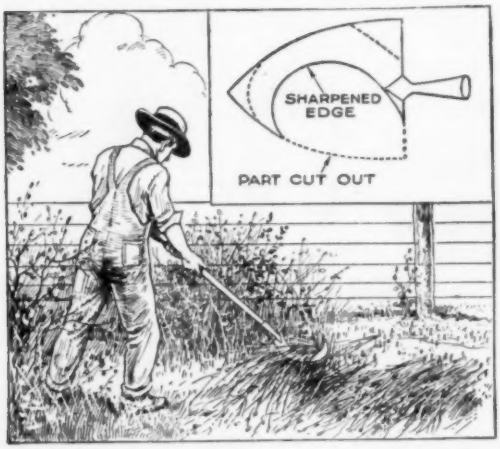
An Electrically Heated Steam Generator for the Amateur Mechanic's Laboratory Which will Supply Sufficient Steam for the Operation of Experimental Engines, without Fire Danger

will be impossible to rivet this piece in place unless it is concaved or "dished," with a flange around the edge for the rivets. To simulate the appearance of fire underneath the boiler a colored miniature lamp may be mounted in the fire box as indicated, or by placing the light behind a fire door that has openings covered with red and orange glass.

The efficiency of such a boiler is quite high; the water enters through the four open spaces in the bottom of the outer carbon and is heated as it ascends through the annular opening of the heating element. The water is heated to the boiling point by its own resistance to the passage of current through it. The fire danger that attends the usual alcohol lamp is eliminated, and if the boiler goes dry, the current is automatically shut off.

Brush Hook Made from a Shovel

The brush hook shown in the drawing has been successfully used for cutting away brush, in clearing land along fence



A Brush Hook Made from a Round-Nose Shovel That for Many Purposes Is Superior to the Ordinary Hook

lines, and similar work; it is made from a shovel of the round-nose type. The blade is cut away along the dotted lines, and the resulting sickle is sharpened. For many purposes a hook of this character will be found superior to the ordinary brush hook, as a better blow can be struck and the sickle-shaped blade makes it possible to handle several small shoots at the same time.—G. P. Melrose, Kamloops, B. C., Can.

Emergency Axle Repair

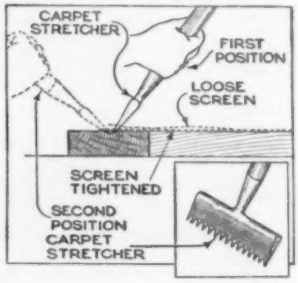
An automobile tourist saved the trouble and expense of being towed to the nearest garage, when one of the rear hubs of his machine became broken. He removed the hub from the wheel so that the end of the axle shaft was exposed. A pipe wrench was put on so as to grip the shaft, and the handle was tied to one of the spokes in the wheel, thus holding the wheel on and causing it to revolve with the axle.—S. S. Spence, Kearney, Neb.

Repairing Eaves Troughs

Holes that are rusted through the eaves troughs of a building can be mended in a simple manner with ordinary cement, sand, and a little wire screen. A piece of the screen, a little larger than the hole to be cemented, is placed inside the trough to serve as a bond and reinforcement. This is coated with concrete made from equal parts of Portland cement and sand. This idea has also been applied to mending the chipped corners of greenhouse windows, in positions where the holes were difficult to reach from the outside, and the repair was found to be much better than putty; the rich concrete made a perfectly water-tight joint between the glass and the wood, which was thoroughly wetted before applying the concrete.—Ansley Hitz, Chicago, Ill.

Pulling Screen Wire Taut

Having to renew the screening on several large porch screens, I was at a loss to determine how the new screen wire could be drawn taut across the frames. In looking through the tool box, I found an old carpet stretcher which was tried out and found to answer the purpose in an ideal manner. To use the stretcher, the screen is fastened along one edge of the frame and the carpet stretcher inserted in the mesh on the opposite edge, drawing the screen wire taut. The stretcher was found to be particularly effective on the large frames, where it would have been practically impossible to stretch the wire evenly by any other method.—Harry G. Schultz, Teaneck, N. J.

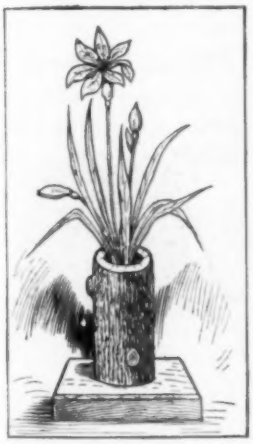


Trapping Rodents without Bait

By setting a spring rat or mousetrap in the usual manner, and placing it so that its trigger end will butt against the wall, it will be found that the animals may be caught without bait. The reason for this is that they usually run along the wall, and across the trap, and as soon as they strike the trigger, the trap is sprung. This method is particularly applicable in a room where there is so much other food that bait would not entice the rodents.—Thos. A. Dickinson, Youngstown, Ohio.

Rustic Flower Vases

A simple and effective flower container for the summer cottage or porch is made from a short length of a tree branch. The bark gives a rustic appearance to the vase, and a variety of effects are obtainable by judicious selection, the white bark of the birch being the most conspicuous. The container may be made of any diameter by using a section of the desired size, from which the interior has been gouged or drilled out. A "liner," which is what florists call a container for water in such vases, may be provided by inserting a can, or other receptacle, into the hollow center.

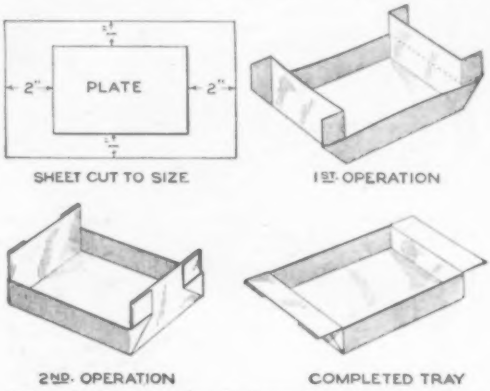


Washers for Garden-Hose Connections

Having to use several lengths of garden hose connected together, it was found that much of the pressure at the nozzle was lost because the water escaped through the washerless connections. Looking about for something from which to make washers, it was found that the cork lining of the ordinary crown bottle cap just fitted into the usual hose coupling. The cork centers were removed from the caps, placed in the hose couplings, and the centers trimmed out with a sharp penknife. When connected together again, with the washers in the connections, leaking at the joints was entirely overcome.—C. E. Diehl, Mammoth, Utah.

Improvised Developing Tray

When a plate or two must be developed in a hurry, away from the dark room and its conveniences, a tray that will be sufficiently satisfactory for emergency purposes can be made in a few minutes from a sheet of stiff paper.



When the Photographer Is Away from the Dark Room He can Develop His Plates in an Emergency Tray Made from a Sheet of Stout Paper, Waterproofing It with Paraffin

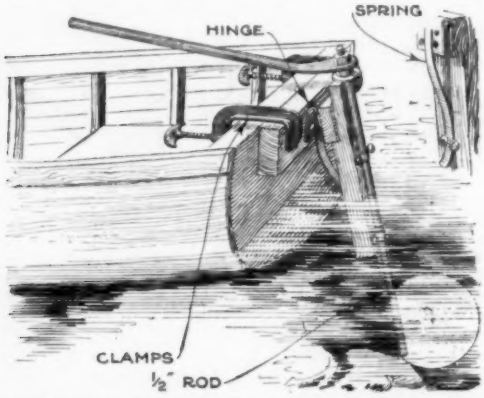
The sheet of paper to be used is measured so as to be 1 in. wider at the sides and 2 in. longer at each end than the plate. For example, if the tray is to hold a 5 by 7-in. plate, the paper should be not less than 7 by 11 in. Fold up the sides and ends as illustrated in the first operation. The second operation consists in turning the projecting ears back, and the third, turning the ends down to complete the tray. If convenient, the tray should be dipped in melted paraffin and allowed to cool, or a lump of the wax can be placed in the bottom of the tray and melted by gently heating over a stove or lamp. Do not use denatured alcohol or similar solvents in the waxed tray, as it will dissolve the paraffin and create trouble.—John H. Curtis, Philadelphia, Pa.

Sanitary Poultry-House Floor

The owner of a flock of chickens, on moving from one house to another, found that a piece of linoleum would not fit any of the rooms in the new home. This was trimmed to the dimensions of the chicken house and laid on the floor, producing a smooth, even surface and stopping up the numerous cracks in the board floor. The floor is kept covered with several inches of litter, and the linoleum has been found to make a durable, sanitary, and draft-proof floor.—Paul H. Reuss, Kalamazoo, Mich.

Boat Rudder for Shoal Water

In fitting a small rowboat with a sail, a removable rudder was desired, but, as this boat was to be used in shallow and



A Rudder for Use in Shallow and Weedy Waters That Swings Out of the Way When an Obstruction is Encountered: Two Ordinary Clamps are Used to Hold the Device to the Transom of the Boat

weedy water, the rudder as well as the leeboards had to be fitted so as to swing out of the way when an obstruction was encountered; this was accomplished in the manner illustrated.

The rudder blade, made of sheet metal, is riveted in a slot cut in the end of a ½-in. iron rod, the upper end of which is threaded and fitted with a tiller made of iron pipe. A piece of wood, about half as long as the ½-in. rod, is fastened at right angles to a small block, and the two joined to a third piece by means of a stout butt hinge, as shown, a piece of spring steel about 8 in. long being screwed underneath the hinge leaf fastened to the horizontal strip. The other end of the spring slides on the vertical stick, between guides formed by driving in a round-head screw on each side. The rudder is strapped to the vertical wooden member so as to swing freely, and prevented from dropping by a machine screw bearing against one of the straps; the horizontal member is fastened to the stern of the boat by means of two iron clamps as in the drawing.

A rudder of this type swings back when it strikes an obstruction, and as soon as this has been passed, the spring pulls the rudder back into place.—Walter E. Burton, Kenmore, Ohio.

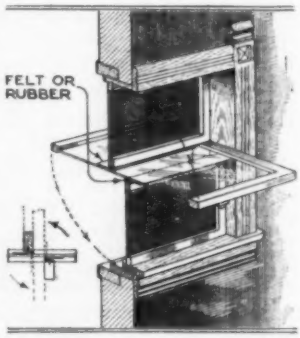
¶ Silver-white or white lead, with yellow lake or Dutch pink, and a little lemon-chrome yellow, will give a very rich shade of olive-drab or amber color.

Filing Papers in Binders

Where office records were kept in post binders, it had been customary to indicate the contents by a label pasted on the top cover. Binders were then stored on shelves in stacks or rows, in which positions the labels were concealed, and considerable time was lost in locating the particular volume wanted. The only other space available for a label or an inscription was the bound end, which was too rough for writing or pasting. The uneven edges were cut down to an even surface with coarse sandpaper, followed by No. 0 sandpaper, the surface thus produced making it possible to write the title of the contents on it with a broad shading pen and ordinary ink. Under this plan, it became as easy to select any binder as to select a book by its title.—Waldemar Landry, Sr., Baton Rouge, La.

Screening Center-Pivoted Windows

One of the most perplexing problems, to many, is to put fly screens over a window that is pivoted at the center instead of sliding. The difficulty may be overcome in the manner illustrated. The screen is made in two sections, each half the width of the window. One section is placed on the outside and the other on the inside, as shown, and a strip of felt or rubber, cut from an old inner tube, is tacked to the screen frames in such a manner that they will always bear against the window and close the opening.—J. R. Linton, Sioux City, Ia.



Indoor Trellis Made from Chain

An attractive trellis for a climbing asparagus fern can be made of brass picture chain. A chain is fastened to each side of the wooden pail in which the plant is growing, by a small hook, the other ends of the chains being looped over the curtain rod at the top of the window. Crosspieces of the chain are used to form a ladder effect.—Jo Walker Humphrey, Kirksville, Mo.

PRIZE OFFERS AND ANNOUNCEMENTS

PRIZE OF $1,000 OFFERED FOR A POEM ON "SPIRIT OF TRANSPORTATION"

To inspire workers in the office or in the machine shop of the automotive industry with a consciousness of the unseen romance connected with their humdrum work, last year 12 paintings, by different artists, visualizing "The Spirit of Transportation," were entered in a contest for a prize of $1,000, offered by the Clark Equipment Company of Buchanan, Mich. This year the same company is offering the same amount for the best poem on the same subject. The theme of the poem must show the influence of the motor car and truck upon civilization, and it will bear the same title as the pictures: "The Spirit of Transportation."

The conditions are: All poems must be typewritten on one side of the paper and must be original. Poems may refer to the paintings, or may be confined to the general theme. Poems submitted must be accompanied by an assignment of copyright, and if postage is inclosed will be returned at the close of the contest. The prize will be awarded by a board of judges, and their decision will be final. The competition closes June 30, 1922. For full details and registration blank, address Clark Equipment Company, Buchanan, Mich.

ANNOUNCEMENT OF THE FOURTH ANNUAL RACES AT PIKES PEAK, COLORADO

Autoists will be interested in the announcement that the fourth annual Pikes Peak hill-climbing races, the biggest competition of the kind in the United States, will be held this year September 4. The Pikes Peak is the highest automobile highway in the world, and these races are the most spectacular contests of the racing season. To the car making the best time, regardless of class or event in which it is entered, is awarded the Penrose Trophy, in addition to the cash-prize money. The cash prizes total $2,100. The course is 12 miles 2,200 ft. in length, and cars can run abreast or pass each other with safety. There are three events; for A. A. A., class-C cars with piston displacement of 183 cu. in. or less; for the same class cars with piston displacement of 183 to 300 cu. in., and for A. A. A., class-D cars with a piston displacement of over 300 cu. in. Address: The Chamber of Commerce, Colorado Springs, Colo.

HIGHLY EFFICIENT MUSICAL SERVICE REGARDED AS CIVIC ACHIEVEMENT

By the terms of the Edward Bok award, $10,000, with a gold medal, is given annually to the person who has been judged to have performed the most noteworthy civic achievement for Philadelphia. The first bestowal of the award, this year, was for a form of service that is not commonly associated with the idea of civic achievement. It was given to Dr. Leopold Stokowski, conductor of the supremely fine orchestra that has made Philadelphia famous throughout the musical world. He has done other work of value to the community, particularly in making music available to people of modest means and small opportunity. He has, on his own account, offered an annual prize to meritorious local musicians. He has, wherever possible, coöperated with local artists and musicians, and with the public-school authorities in the encouragement of music. Thus, it is evident that his work was appropriately characterized as civic achievement.

THE SECOND NATIONAL CONFERENCE IN INTERESTS OF STATE PARKS

The second national conference on state parks, which has been called in the interests of state-park development by John B. Payne, chairman of the conference, will be held at the Bear Mountain Inn, Palisades Interstate Park, New York, May 22-25, 1922. The first national conference was held in Des Moines, Ia., in January, 1921, and since that time a great deal has been done in this work. The importance of a national development of state parks cannot be overemphasized. These parks, when well developed, produce revenue, stimulate travel to and through the state, preserve the beautiful native scenery and historic spots, and are in every way of benefit to the state. One of the features of these parks undoubtedly will be the establishment of free public camps, which have been so popular in the national parks. Two days of the conference will be devoted to business sessions, while the remainder of the time will be utilized by trips of inspection through the Palisades Interstate Park, West Point, a new state highway around Storm King, the New York Zoölogical Park, and the Bronx River Parkway. This will give the delegates an excellent opportunity to see the splendid state-park development in that part of the country.

INDIANA LITTLE THEATER SOCIETY OFFERS PRIZES FOR FOUR PLAYS

The Little Theater Society of Indiana offers prizes amounting to $100 for four plays, and also a production by the Little Theater of the plays selected, and their publication in book form. Plays submitted must be original and unproduced works by residents of Indiana. In form, length, and construction they must be of the one-act type. No author may submit more than four plays. Preference will be given to plays dealing with present-day life and local conditions. Besides the prize money, the authors of the plays selected will receive one-half of all royalties derived from their subsequent use, and from their publication. All plays must be typewritten, and must be mailed before June 1, 1922, to Mrs. William O. Bates, President of the Little Theater Society, 756 Middle Drive, Woodruff Place, Indianapolis, Ind., from whom further particulars may be obtained.

NATIONAL FOREIGN-TRADE CONVENTION WILL INCREASE AMERICAN EXPORTS

In connection with the ninth National Foreign-Trade Convention, held at Philadelphia, Pa., early in May, a series of nine brief articles on "The ABC of Foreign Trade" was widely circulated. The object was to point out how closely related is prosperity in the United States to the volume of its foreign trade. The main theme of the convention was financing and expanding foreign trade. It was shown that domestic consumption alone cannot dispose of the full production of American industry, and that the surplus must be sold abroad. This surplus is generally admitted to be about 20 per cent in manufactured goods, but besides that, there are certain raw materials of which the surplus is very much greater. It is estimated that nearly 50 per cent of the cotton and fully 25 per cent of the wheat produced in this country have to find a foreign market, and it is obvious how much the southern states in the one case, and the northern states in the other, must be affected by the failure to find a market for any portion of this great surplus. It should be realized that the difference between good times and bad times in the United States is the difference between ample foreign markets and a lack of them.

EXAMINATIONS IN THE AIR SERVICE TO APPOINT FLYING CADETS

Examinations are now being held in the air service for the appointment of flying cadets. Both enlisted men and civilians are eligible. At the time of application, candidates must be unmarried male citizens, between the ages of 20 and 27 years. They must be high-school graduates, or possess an equivalent education. They must be of excellent character, and sound in physique.

The base pay of flying cadets is $75 a month, with a ration allowance not exceeding $1 a day. Other allowances, such as clothing and equipment, are the same as those of a private in the air service. The term of enlistment is three years, but may be shortened by an earlier successful completion of the prescribed course, when the cadets will be commis-

sioned second lieutenants in the Air Service Officers' Reserve Corps.

Examining boards are located at the various flying stations in the United States and its dependencies, and applicants from civil life will be required to pay all expenses incident to their appearance before the boards.

The next class for cadets in airplane service is scheduled to commence about July 1, and for balloon and airship service about September 25, this year. Other information and application blanks can be obtained by addressing the War Department, Office of the Chief of Air Service, Washington, D. C.

TRIENNIAL COMPETITION FOR PRIZE FOR BEST WORK ON ELECTRICITY

The triennial contest for the prize known as the George Montefiore Foundation, which was won last year by Dr. J. B. Whitehead, of the Johns Hopkins University, is again announced by the Association des Ingénieurs Electriciens Sortis de l'Institut Electrotechnique Montefiore, of which L. Calmeau, Rue Saint-Gilles 51, Liège, Belgium, is general secretary. This prize, amounting to 21,000 francs (normally $4,200), is awarded for the best original work in French or English upon the scientific advance of electricity and its technical applications. Though known as the competition of 1920, the next award will be made in 1923, and works may be submitted up to April 30 of that year.

PRIZE OF $100 FOR THE BEST POEM BY ANY COLLEGE UNDERGRADUATE

Through the Poetry Association of America, Witter Bynner, its president, offers a prize of $100 for the best poem, or group of poems, not exceeding 200 lines in length, written by an undergraduate of any college or university in the United States. No limit is placed upon the number of entries by any one person, and previous publication does not disqualify. On each page of the manuscript must be written the name and address of the contestant, and the mark "P. S. Contest." The contest closes May 15, 1922. Poems should be addressed to Haniel Long, 5559 Beeler Street, East End, Pittsburgh, Pa.

PRIZE-ESSAY CONTESTS TO ENCOURAGE TEMPERANCE STUDY IN SCHOOLS

Temperance study in the public schools is being encouraged through the National W. C. T. U. by the offer of prizes for essays on the subject. The essay writing forms a part of the class work in the schools, which is promoted by a local superintendent, in each state, of the Scientific Temperance Department of the National W. C. T. U. A leaflet is issued containing a full list of the subjects and rules for the prize-essay contests, which can be obtained by addressing either the state superintendent or the Department of Scientific Instruction, National W. C. T. U., Evanston, Ill.

TWO PRIZES OFFERED FOR THE BEST HUMAN SPINES IN NORTH AMERICA

For the two best human spines in North America, cash prizes to the amount of $1,500 are offered by the National League for the Prevention of Spinal Curvature, an osteopathic organization. Women over 18 years of age may compete for a prize of $1,000, and girls or boys under 12 years for one of $500. The contestants for the prizes must be examined in each instance by a graduate of osteopathy, who has received his degree from one of the associated colleges under the American Osteopathic Association. The contest closes May 25, 1922, and the prizes will be awarded June 15. Address, Dr. Nathaniel W. Boyd, 126 East Washington Lane, Germantown, Philadelphia, Pennsylvania.

FOR BEST NAME FOR RECKLESS DRIVERS CASH PRIZE OF $25 IS OFFERED

It is desired to find an appropriate name, or epithet, to apply to the motor driver who disregards the traffic signal, drives on the wrong side of the street, tries to "shave" another vehicle too closely, and who through his carelessness and recklessness endangers the lives of all, but particularly of children. For the best name denouncing an offender of this kind, a cash prize of $25 will be paid by the American Automobile Association. The name must be submitted not later than May 15, 1922, and the prize will be awarded May 29. Address, A. A. Association, 1108 Sixteenth Street, N. W., Washington, D. C.

PRIZES FOR BEST SYSTEM OF MANAGEMENT OF HOUSEHOLD EXPENSES

To encourage economy and good accounting methods in the management of the household, which is best done by the adoption of a budget system, as fully explained in a little volume entitled, "Menter Plan of Home Budget," the publishers offer $5,000 in cash prizes. For the most complete budget record on the Menter plan for a period of at least six months, ending Dec. 31, 1922, a first prize of $500 is offered. Besides this, $4,500 will be distributed in $25 awards to 180 of the best records sent in. Address, The Menter Company, 467A Seventh Ave., New York City,

¶For the best lists of household uses of a cleansing cream, called "Sanlo," the manufacturers offer a first prize of $50; a second of $25; a third of $10, and three others of $5 each. The prizes will be awarded by the officers of the company and its advertising department. The contest closes Aug. 31, 1922. Address, Contest Department, The Parker Sanlo Co., Inc., Rochester, New York.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize $10,000; announced September issue, 1921; awarded each year by Edward Bok, former editor of The Ladies' Home Journal.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

Best Slogan Describing Razor: Prize $500; announced January issue, 1922; closes June 30; address, Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

American-History Essays: Prizes, $3,000 for professors, $2,000 for specialists, $1,000 for school-teachers, $1,000 for students, and $500 for undergraduates in U. S. colleges; announced March issue, 1922; closes May 31. Address, Knights of Columbus Historical Commission, K. of C. Bldg., 199 Massachusetts Ave., Boston, Mass.

Best Setting of a Song: Prize $100; announced April issue, 1922; closes July 1; address, D. A. Clippinger, 617-18 Kimball Building, Chicago, Ill.

Man-Propelled Airplane: Prize 20,000 francs; announced April issue, 1922; closes September 13; address, Maison Peugeot, 80 Rue Danton, Levallois-Perret (Seine), France.

Posters to Incite Kindness to Animals: Prizes, $25, $15, and $10 for each of eight groups; announced May issue, 1922; closes May 20; address, Poster Department, American Humane Association, Humane Society Bldg., Albany, N. Y.

Essays to Incite Kindness to Animals: Prizes, $25, $15, and $10; announced May issue, 1922; closes May 20; address, Essay Contest Department, American Humane Association, Humane Society Bldg., Albany, N. Y.

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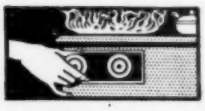

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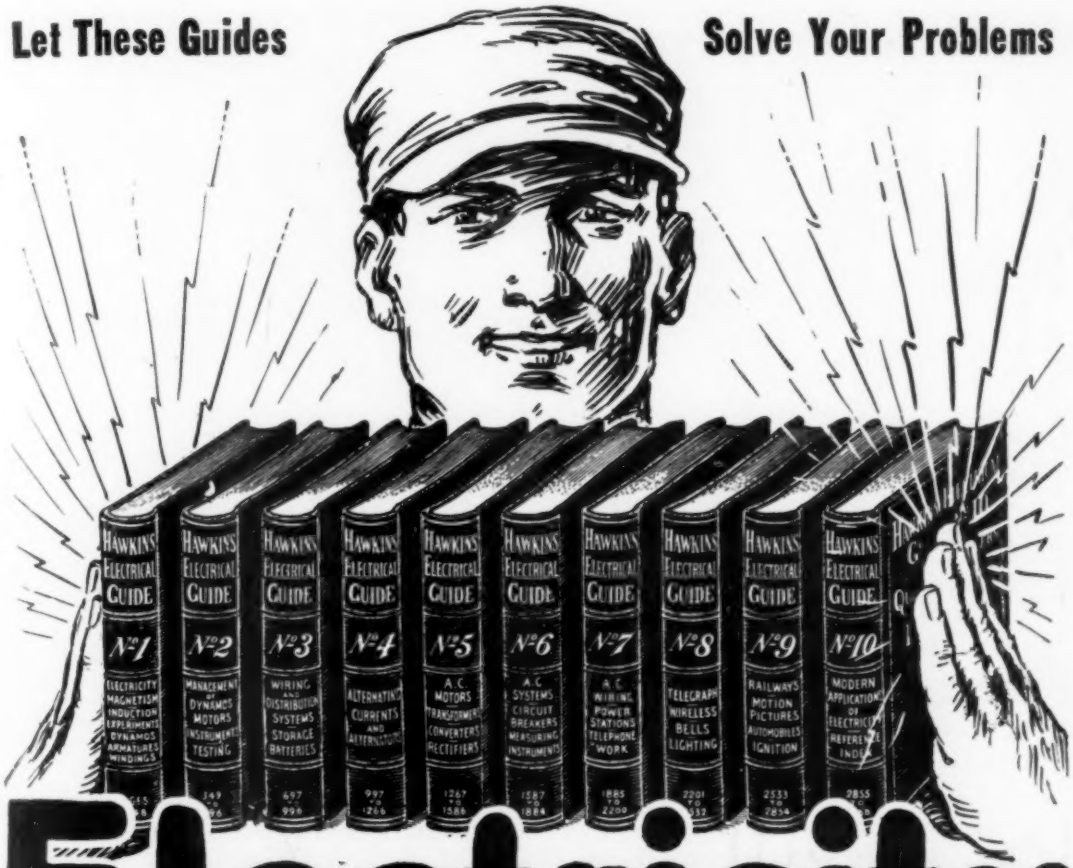

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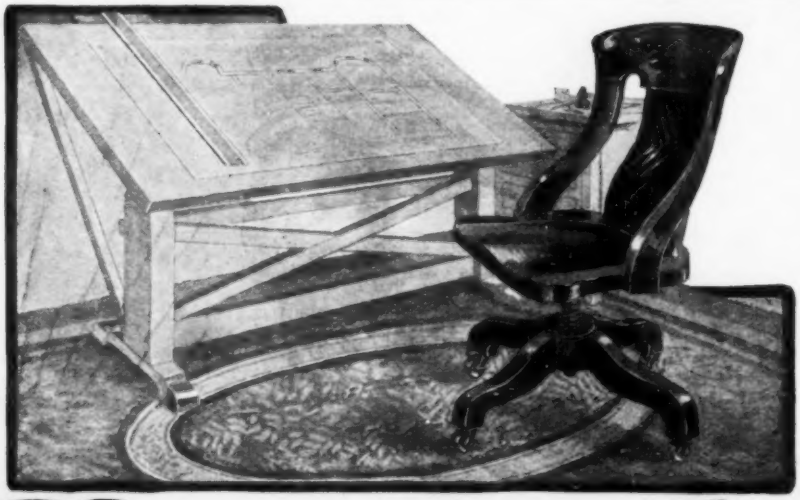

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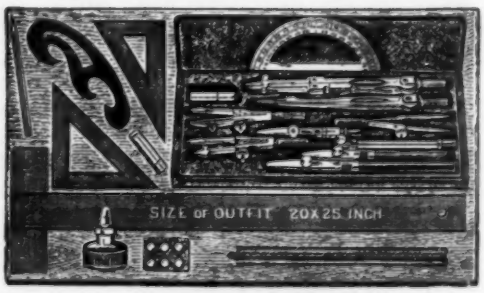

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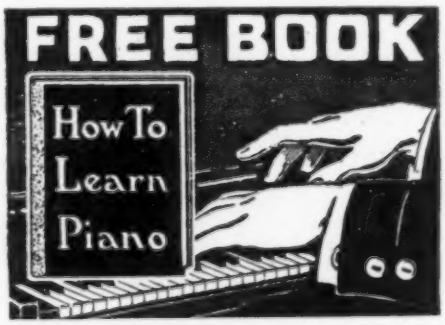

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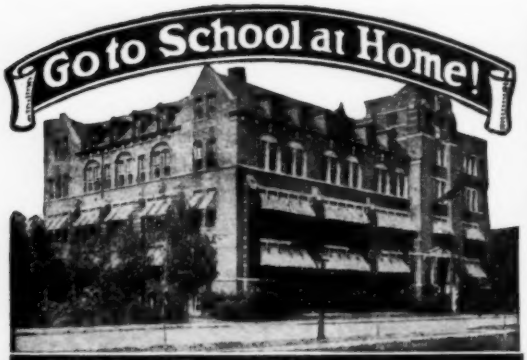

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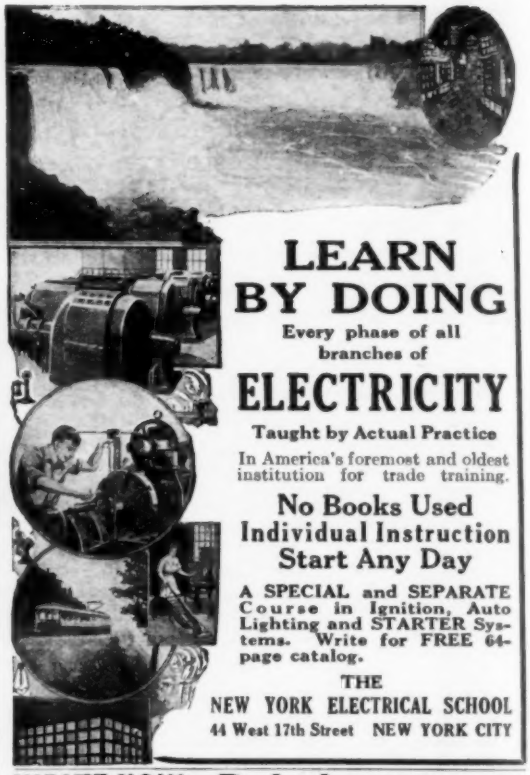

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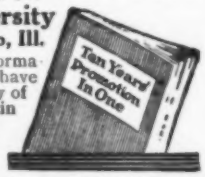

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- ☐ Railway Accounting and Station Management
- ☐ Law—Degree of LL. B.
- ☐ Commercial Law
- ☐ Industrial Management Efficiency
- ☐ Modern Business Correspondence and Practice
- ☐ Banking and Finance
- ☐ Modern Foremanship and Production Methods
- ☐ Personnel and Employment Management
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- ☐ Business English
- ☐ Commercial Spanish
- ☐ Effective Speaking
- ☐ C. P. A. Coaching

Name .....

Present Position .....

Address .....

LaSalle Extension University

The Largest Business Training Institution in the World

I Have 5000

For Sweeney Trained Men

E. J. SWEENEY

So confident am I of the practical training that is offered you in this Million Dollar trade school that if you will agree to take the necessary preliminary work, I will agree to employ you upon graduation.

This position requires not only automotive training, but radio training as well. But to equip you for this work I will give you a free course in radio.

Furthermore—I need you NOW, and to make it possible to get the right sort of men I WILL PAY YOUR RAILWAY FARE TO KANSAS CITY.

I Want Sweeney Trained Men

to act as my salesmen and representatives to sell radio sets, storage batteries, accessories, etc.—to open garages, tire shops in 5000 places where I am opening sales branches.

If you are mechanically inclined and want an assured position write me today for a sample contract.

I will make this offer only to those who are sufficiently in earnest and sufficiently energetic to write me at once. Naturally, I will employ only Sweeney trained men.

Learn Radio Free

Sweeney Trains You To Fill Positions Like These

Chauffeurs	$90. to 150.
Truck driver	$125.
Tire Vulcanizer	$100 to 200.
Welders	$140. to 200.
Battery Man	$150. to 200.
Auto Mechanic	$6. to 10. a day
Auto Electrician	$225.
Tractor Engineer	$10 a day
Garage Manager	$150 to 400
Demonstrator and Salesman	$150 to 500.

You Must Apply Now

If you are ready for PROFITABLE EMPLOYMENT after eight weeks' training write me today.

Do not delay—for this opportunity may not occur again. For when these jobs are filled I cannot offer such employment agreement any longer.

For fifteen years I have trained young men mechanically inclined. This is the first time I have been able to GUARANTEE A JOB. And I can only guarantee a certain number. But you can be one of those who take training UNDER MY GUARANTEE OF EMPLOYMENT IF YOU ACT NOW.

Please do not apply unless you are willing to take eight weeks' course of training.

LEARN A TRADE

Sweeney

SCHOOL OF AUTO-TRACTOR-AVIATION

1023 SWEENEY BLDG. KANSAS CITY, MO.

Jobs Open Now

BRANCH MANAGERS WANTED!

You have heard of RADIO? Do you know about the new business that is taking the world by storm? Do you realize the opportunities in this business? What it means to handle and install radio sets? To act as salesmen. Why, one man last week got orders for over $2,000 worth of radio supplies—everybody wants to hear the voices in the air. Let me tell you about the opportunities in RADIO. Remember my RADIO COURSE IS FREE. Not a cent extra charge.

Probably you have read my advertising before. But this is a special offer. I want 5000 go-getters. Give yourself a real training. If you will qualify I WILL HIRE YOU. If you are in earnest write me today.

I Pay Your Railroad Fare This training takes in NOT ONLY the Sweeney System of Practical Instruction which was endorsed by the Government during the War in turning out over 5000 auto mechanics, and which has put 46000 men into the auto business in civil life, but INCLUDES without a cent's extra cost the new FREE RADIO INSTRUCTION and my new offer to PAY YOUR RAILWAY FARE to Kansas City no matter where you live.

LEARN A TRADE

Now is the time for you to learn a trade. I teach men to be successful auto mechanics. Can you make a tire? Can you weld a broken crank case? Can you build a battery? Can you repair an automobile? Can you go anywhere in the U. S. and get a job in a garage, repair shop, auto agency, tire shop, welding concern? Can you get a job as a driver or chauffeur?

Get My Big Free Catalog

FREE The first step is to send me the coupon or write a postcard for my 72-page illustrated catalog. It tells all about this Million Dollar trade school. It tells how to equip yourself for a real job. It tells how thousands of men just like you, without any special knowledge but simply a liking for mechanics, MADE A LIFETIME SUCCESS as a result of this simple training. I don't care how old you are. I don't care how small your education, for I teach with TOOLS NOT BOOKS. It tells also about this new radio business. How to make money. How to make your own sets. It tells about the school and our big swimming pool and how students enjoy themselves while learning. It gives you in the own words of hundreds of men just what they learned here and what they have done since graduating. And my special offer. This is not in the catalog. But I have big plans. I need 5000 salesmen and representatives to handle Sweeney batteries and radio supplies. I want managers for branch offices. I will hire you if you are in earnest and will qualify. And if you write me now I will send you SAMPLE CONTRACT. And if you are willing to go to work I WILL PAY YOUR RAILWAY FARE to Kansas City. Write me NOW.

EMORY J. SWEENEY,
President.

This FREE Book Tells You Everything

EMORY J. SWEENEY, President
1023 Sweeney Bldg., Kansas City, Mo.

Send me your offer of a guaranteed position, your big free catalog and full details of the Sweeney eight weeks' course leading to an immediate money-making opportunity.

Name .....

Address .....

For Big Offer and Catalog Mail this Coupon Today

NO COLORED STUDENTS ACCEPTED

FREE!

This Ad-Writer's Wonderful Working Outfit

Yes, FREE to you, a complete Ad-Writer's Working Outfit! Not a penny to pay. You get this superb outfit as a FREE gift on our sensational new offer. We want to interest 5,000 more men in the great profession of ad-writing. The "field" needs more good men and needs them badly. We want to interest 5,000 men quickly in the opportunity—hence this amazing free offer. The 5,000 ad-writer's outfits will go fast. Immediate action is necessary if you want one free. Mail coupon **today** for full details.

All These Articles FREE

- 1 Drawing Board
- 1 T Square
- 1 Triangle
- 2 Drawing Pencils
- 1 Double Line Ruling Pen
- 1 Single Line Ruling Pen
- 1-2 Dozen Thumb Tacks
- 20 Sheets of Drawing Paper
- 1 Ad Rule
- 1 Binder
- 1 Compass
- 50 Envelopes [Self-Addressed]
- 50 Sheets of Paper
- 1 Eraser
- 1 Bottle Higgins India Ink
- 1 Bottle Red Ink
- 1 Bottle Library Paste
- 1 Straightline Rule
- 1 Pr. 8 in. Shears
- And other useful Articles

$200-A-Week Ad-Writers Use The Same Tools These are real ad-writers' "tools"—the very same kind used by the men who are getting $100, $200, $300 a week. There's inspiration in handling these instruments. You work at your best. "Just the thing" say successful ad-writers, "to start ad-men off right."

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Ad-writing is the best paying profession in the world. Statistics prove it. One ad-writer, formerly a bookkeeper makes over $1,000 a week. Another, an ex-shophand, earns over $200 a week. Scores step right into Ad-writing from other lines. No special "gift" required—just common sense plus some training. Let Page-Davis experts train you—by mail. Learn in your spare time how to lay out and write ads that "ring the bell."

Now! Mail the coupon for our FREE Ad-writer's working outfit offer. Don't delay—thousands will speak for one of these outfits. Only 5,000 to be given free. Get the coupon in the mails today. It brings also full information on the famous Page-Davis Course in ad-writing—postpaid and free. No obligation. ACT NOW.

Free Coupon

Page-Davis School
Dept. A-18 CHICAGO, ILLINOIS

I want an Ad-writer's working outfit free. Give me the details of this offer and also particulars of your course in Ad-writing. This places me under no obligation.

Page-Davis School
Dept. A-18
CHICAGO, ILL.

Name .....

Street and Number .....

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Study YOURSELF—and promotion, more money and steady employment are certain. We help you "find" yourself in the field where you fit best. We analyze you and assist you with our **free employment service.** Ask for the free booklet "Self-Appraisal" and learn how you can insure advancement and a better job.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of Popular Mechanics Magazine, published Monthly at Chicago, Ill., for April 1st, 1922.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, who having been duly sworn according to law, deposes, and says that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 6 No. Michigan Ave., Chicago, Ill. Editor, H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill. Managing Editor, J. L. Peabody, 6 No. Michigan Ave., Chicago Ill. Business Manager, H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill. 2. That the owners are [Give names and addresses of individual owners, or, if a corporation give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock]: H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill., L. B. Windsor, 6 No. Michigan Ave., Chicago, Ill., First Trust and Savings Bank, Trustee for H. H. Windsor, Jr., Chicago, Ill. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are [if there are none so state]: None. 4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

H. H. WINDSOR, Editor.

Sworn to and subscribed before me this 27th day of March, 1922.

J. GRAHAM, Notary Public

[My commission expires June 17, 1924.]

You Might Call It Luck

If Only One Man Had Jumped to Such Amazing Earnings

-but Hundreds Have Done It!

WHEN a man steps from a $50 a month job as a farmhand to a position that paid him $1,000 the very first month—was it luck?

When another man leaves a job on the Capitol Police Force at a salary of less than $1,000 a year and then in six weeks earns $1,800—is that luck?

Probably the friends of Charles Berry of Winterset, Iowa, and of J. P. Overstreet of Denison, Texas—the two men mentioned above—call them lucky. But then there is F. Wynn of Portland, Ore., an ex-service man who earned $554.37 in one week—and George W. Kearns of Oklahoma City, whose earnings went from $60 a month to $524 in two weeks. And C. W. Campbell of Greensburg, Pa., who quit a clerking job on the railroad to earn $1,562 in thirty days.

"Last week my earnings amounted to $554.37; this week will go over $400."—F. Wynn, Portland, Ore.

There is nothing exceptional about these men. They live in all parts of the country—they had been engaged in all kinds of work. Many had been clerks, bookkeepers, mechanics. Some had already achieved successful places in the business world.

No Limit to the Opportunities

And then in one swift stroke, they found themselves making more money than they had ever dreamed possible. The grind of routine work—the constant struggle to obtain even a slight increase in earnings—the discouraging drudgery of blind-alley jobs—all this was left behind for careers of immediate and brilliant success. And great as are their earnings today, they are looking forward to increasing them constantly—in fact, there is no limit to the amounts they may earn—only their own efforts can determine that.

"I had never earned more than $60 a month. Last week I cleared $306 and this week $218." — Geo. W. Kearns, Oklahoma City.

The remarkably quick success of these men sounds like luck—the sheerest kind of luck. But of course it cannot be that—not when hundreds have found the way to such amazing good fortune —*all through the same method.* There must be a definite, practical, workable plan behind their sudden jumps to big earnings.

The Back-Bone of Business

And there is. In the first place they discovered a vital fact about business. They discovered that the big money is in the Selling end of business. Salesmen are the very life blood of any concern—upon them depends the amount of profits made.

And for the men who are in the "Star" class—who are Masters of Salesmanship—there is practically no limit to their earnings.

And that is how the men whose pictures you see and hundreds of others like them, found the way to their present magnificent incomes. *They are all Master Salesmen now!*

New Way to Enter This Field

Yet previously they had no idea of becoming Salesmen—many didn't even think it possible to do so. But they learned of an amazingly easy way by which any man can quickly become a Master Salesman—and in his spare time at home!

Secrets Only Master Salesmen Know

Salesmanship is not a natural gift—it is an art and science that is open to any man. There are fundamental rules and principles that anyone can put into practice—there are Secrets of Selling that put any man who knows them into the "Star" class.

"The very first month I earned $1,000. I was formerly a farmhand."—Charles Berry, Winterset, Iowa.

The proof of this is in the wonderful success achieved by men who, without any previous Selling experience, have suddenly become Master Salesmen thru the National Salesmen's Training Association. Step by step—in their spare time at home—they were taken through every phase of Salesmanship. Every underlying principle of sales strategy was made as simple as A-B-C. Thru the National Demonstration Method every form of Sales problem is solved.

"After ten years in the railway mail service I decided to make a change. . . . My earnings during the past thirty days were more than $1,000."—W. Hartle, Chicago, Ill.

Startling Proof Sent Free

Whether or not you have ever thought of becoming a Salesman, you should examine the facts about the tremendous possibilities for big earnings in this fascinating field. Read the extraordinary stories of others and see how easily you can do what they are doing. The PROOF is so overwhelming that it may mean the turning point in your life, as it has in so many others. Simply mail the coupon below. It will bring you by mail the whole wonderful story, and in addition a great Book "Modern Salesmanship" and full particulars about the remarkable system of Salesmanship Training and Free Employment Service of the N. S. T. A.

Right now—tear off the coupon and mail it today. It costs you nothing to do this—it obligates you in no way.

National Salesmen's Training Association

Dept. 12-G **CHICAGO, ILL.**

NATIONAL SALESMEN'S TRAINING ASSOCIATION
Dept. 12-G, Chicago, Ill.

Please mail me Free Proof that I can become a Master Salesman and qualify for a big money position. Also send your illustrated Book "Modern Salesmanship" and particulars of membership in your association and its Free Employment Service. This is all free of cost or obligation.

Name .....

Address .....

City ..... State .....

Age ..... Occupation .....

LEARN CARTOONING

If you like to draw, develop your ability and quickly raise your income

Hundreds of others who had the same ambition have become successful cartoonists through the Landon Picture Chart Method of teaching cartooning. They are now **earning from $75 to $400 and more per week.**

The Landon Course of Cartooning with the famous Landon Picture Charts teaches you how to make **original** drawings. As your eye follows sketch after sketch on these charts, you learn just how and where to start a drawing and place each line in completing it.

You can learn during your spare time, at home—and a personal criticism service on each lesson corrects mistakes which you may make.

Celebrated cartoonists and educators everywhere pronounce **Landon Picture Charts** as the greatest achievement in the teaching of drawing. No other plan gives you such a thorough understanding of the fundamentals of drawing—none develops originality so rapidly.

The opportunities in cartoon work were never so great as at present.

Write today for sample Landon Picture Chart, long list of successful Landon students and full information showing the possibilities for you. **Please state your age.**

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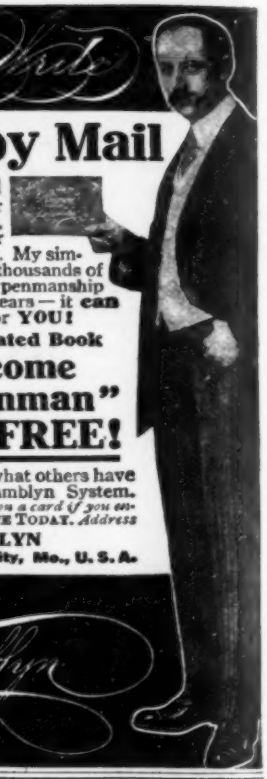

I CAN make a **good penman** of you at your home during spare time, no matter where you live or how poorly you now write. My simplified system has shown thousands of **others** the way to good penmanship during the past twenty years—it **can** and **will** do the same for **YOU!**

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It contains general information, with testimonials and beautiful specimens of penmanship showing what others have accomplished by the Tamblyn System. **FREE!**

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How to Box to Win, How to Build Muscle, How to Punch the Bag and How to Stand, Walk or Run.

This interesting book written by experts is known also as "The Book of Health and Strength." It will greatly assist everyone in keeping fit, in putting them in condition to master a strenuous undertaking either physical or mental.

63 illustrations. Size 4½x7½ in. Paper copy. 135 pages.

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THE world is aflame with Radio. Never before in the history of the country has an industry leaped to the forefront as rapidly as this great, new science. Hundreds of thousands of radio receiving sets are in operation—tens of thousands of sending stations will be erected—and this enormous craze is permanent. Even to-day manufacturers are months behind their orders! Improvements are being made every day which must increase the demand for radio equipment to even *greater* proportions than now.

Men of foresight, men of vision know what this means. Never before has there been such an opportunity. Radio-tricians are needed to-day everywhere. More and more will be needed as the demand for radio installation, radio operation, radio maintenance, radio repair, radio salesmanship becomes greater and greater.

Wherever you go, there are hundreds of radio sets to be installed—wherever you go, thousands upon thousands of dollars worth of radio equipment is being sold—wherever you go, there are radio sets to repair; and if you seek adventure, there are radio sending stations calling to you from ships and land stations all over the world.

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The National Radio Institute has a record of over 8,000 students. It is the pioneer school. It teaches every phase of radio from the ground up. It teaches by means of actual practice, actual assembling of a radio outfit, actual operation of radio equipment. It teaches by problem and principle so that National Radio-tricians are in demand everywhere.

Here is a profession which is paying enormous earnings to men all over the country to-day—a profession that will make hundreds of men wealthy—a profession far more lucrative than that of any other technical or mechanical employment you can secure.

What will you do?

The world is aflame with radio. What are you going to do to "cash in" on the demand for men, for equipment, for experience? Are you going to sit idly by wondering what it is all about, or are you going to make the most of this, the greatest opportunity presented to men of ambition in 50 years.

Write at once for the complete catalogue to the National Radio Institute. This is the turning point in your life. Upon your decision *this instant* may depend your entire future. Mail the coupon, or write a letter NOW—*for your own sake!*

NATIONAL RADIO INSTITUTE, *Radio Headquarters*

Dept. 1085 **Washington, D. C.**

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NATIONAL RADIO INSTITUTE, *Radio Headquarters*
Dept. 1085, Washington, D. C.

Please send me your book telling how I can become a Radio-trician through your Home Study Course, in my spare time.

Name.....

Address..... City..... State.....

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Let me train you to pass the U. S. Civil Service Examination with HIGH RATING so you can get a position QUICKEST—at $1600 to $2300 guaranteed. I have trained THOUSANDS, and I guarantee you a position, or money back.

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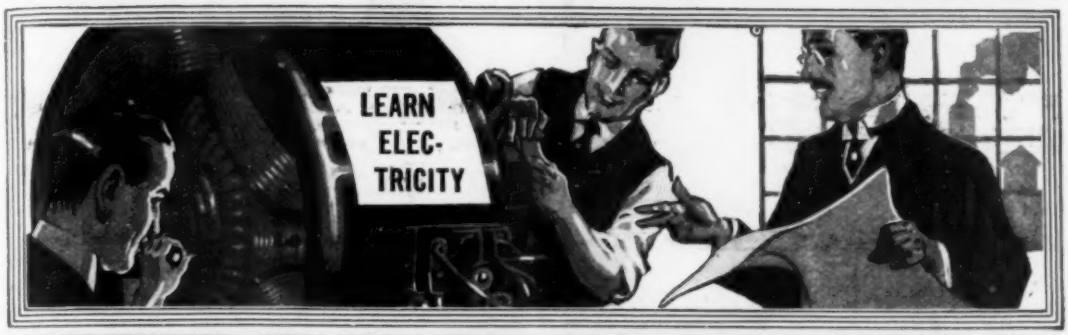

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Make this the most profitable and enjoyable summer of your life. Come to Chicago, the greatest summer resort city in the country on beautiful Lake Michigan, and the greatest electrical center in the world. We will pay your railroad fare from any place in the United States. See the country at our expense. And at the same time become a skilled electrical expert in the great shops of Coyne.

EARN WHILE YOU LEARN

Our Employment Department helps place students in jobs to earn a part or all of their expenses while studying. No charge for this service. Hundreds have worked their way through. The catalog explains fully.

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No books or useless theory. You are trained on $100,000 worth of electrical equipment. Everything from door bells to power plants. You work on motors, generators, house-wiring, autos, batteries, radio, switchboards, power plants—everything to make you an expert ready to step right into a position paying from $45 to $100 a week. Learn electricity in the electrical center of the world. Here you see the mighty power plants, the great electrical manufacturers and marvelous electrical sign displays. You truly live with electricity in Chicago.

Coyne Training is Complete

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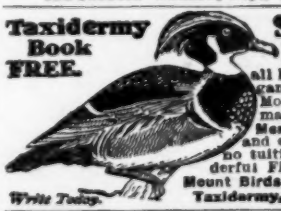

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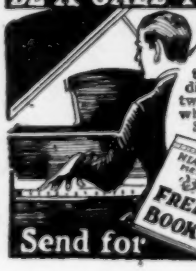

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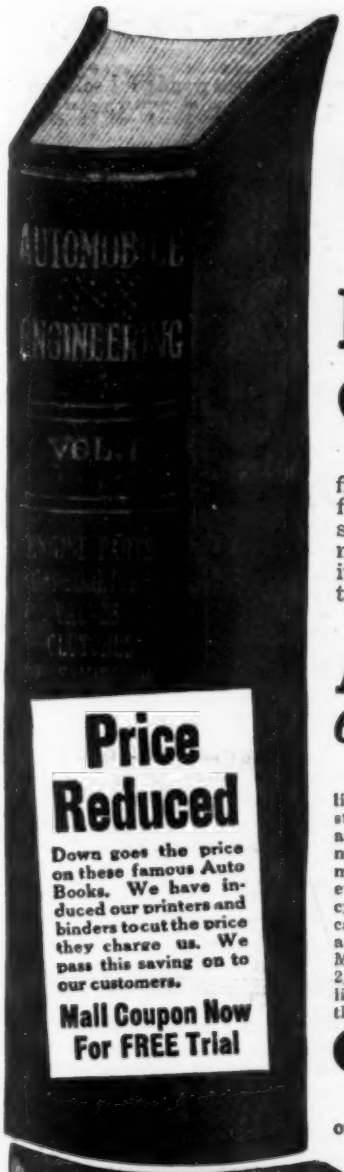

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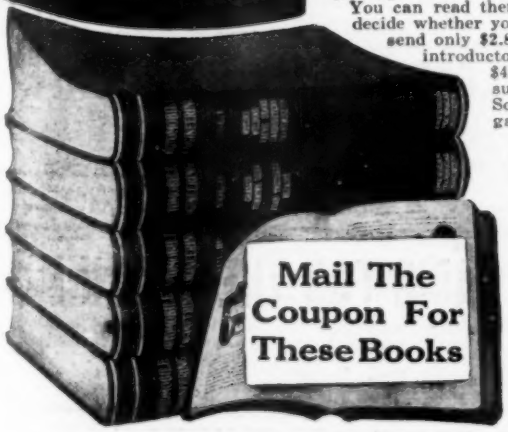

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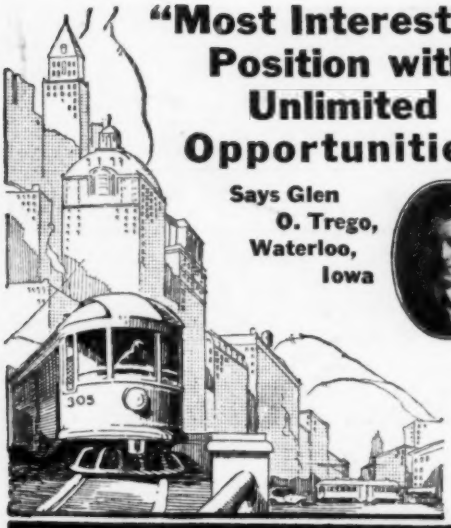

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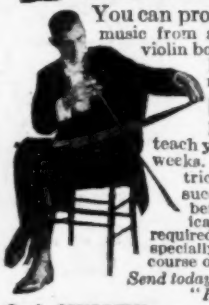

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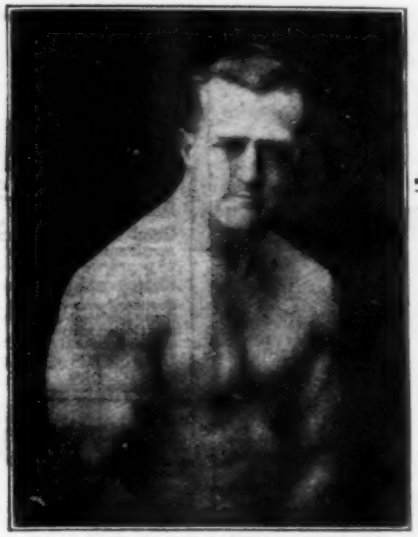

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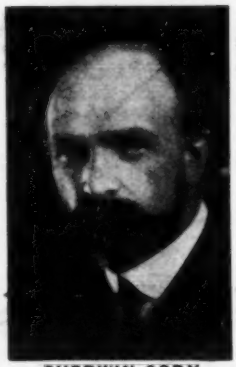

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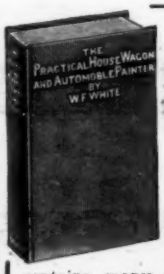

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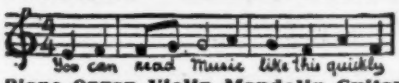

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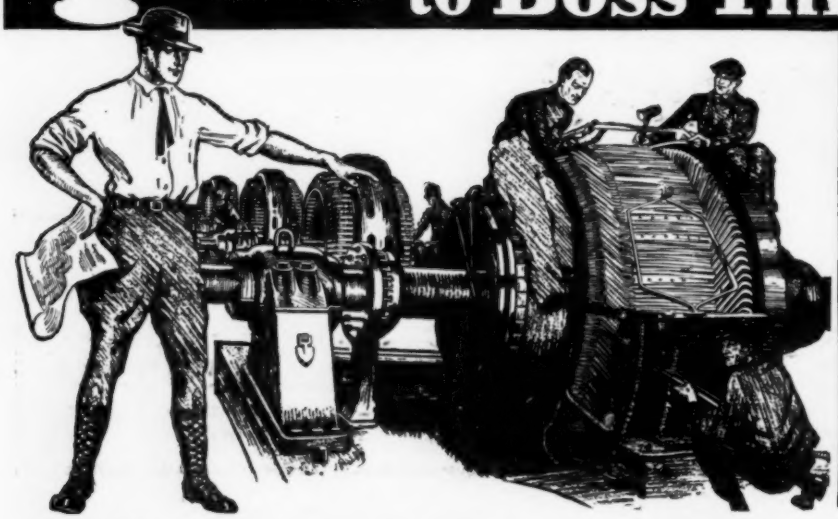

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I MADE $30 a week home. French bread-making. 15 years' experience; free booklet tells. Ashbrook, 67, Marengo, O.

BE Independent. We teach by mail how to manufacture unexcelled Toilet Preparations. Earn while you learn. Results guaranteed. Particulars Free. School of Cosmetics, Box K, Omaha, Nebr.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

LEARN the collection business. Good income, quick results. Interesting booklet, "Skillful Collecting," free. National Collectors Assn., Long St., Newark, O.

START a Paying Business of Your Own. Be a business man. Any location. 8,000 new Tire Vulcanizing and Repair Stations needed. Business always good. Are you ambitious? $200 will start you. Write at once. Wonderful opportunity. Equipment Co., 11 Canal, Cincinnati, Ohio.

MARBLE mixing instructions, covering wood or cement flooring ½ inch thick, fireproof, waterproof, low cost, sanitary, all colors. Particulars, 200 illustrations free. Chris Mahler, Box 122, Huntington, N. Y.

LET Me Show you how to make real money. Absolutely new proposition and new products. Materials cost $2.00, sell for $16.00. One man sold a thousand dollars worth in a week. Exclusive manufacturing and sales rights to one man in each territory. Write today for booklet 5, Crouch, Chemist, 309 Broadway, New York.

SILVERING Mirrors! My exclusive French Tartaric method opens enormously profitable business. Booklet free. H. Barstow, 534 23d Street, Oakland, Calif.

MAIL Order Business is your opportunity. Breniser's Famous Handbooks teach how to start small, grow big. Sell merchandise, service, ideas; enormous profits. Spare time to begin. Get complete set, 11 books, $3.00, and be posted. Breniser, 335 Walnut, Philadelphia. Descriptive Catalog and big batch interesting mail order information, 25c. None free.

$100,000 CORPORATION wants capable man; open office; manage sales for High Class New Device. Every Home a Prospect. Big money-making possibilities for the right man. Opening in every city. Cost $2.00, retails $5.00. $500 to $2,000 necessary to finance exclusive agency. Scott Corporation, 82 W. Washington, Desk G, Chicago.

EXCEPTIONAL Opportunity for Sales Manager capable of handling state distribution. Marvelous new Adding Machine. Retails $15. Work equals $350 machine. Tremendous possibilities. Unlimited profits. Write quick for details. Lightning Calculator Co., Dept. B, Grand Rapids, Mich.

RESPONSIBLE Corporation wants general sales managers to open branch office, manage salesmen. $500 to $5,000 necessary; expenses allowed to Baltimore if you qualify. Address Manager, 603 N. Eutaw St., Baltimore, Md.

CLEAN Wallpaper and Window Shades this winter and spring. Big demand. Take large contracts. We show you how. C. Swanson & Sons, Mankato, Minn.

THIS May Be Your Opportunity. A large, modern Middle Western manufacturing institution will consider proposals from inventors and small manufacturers, with a view of manufacturing on royalty basis or of buying outright. Small brass products preferred, but any high-grade proposition will be considered. Address P. O. Box 426 Kokomo, Ind.

WE Start You in Business, furnishing everything; men and women, $30.00 to $100.00 weekly operating our "New System Specialty Candy Factories" anywhere. Opportunity lifetime; booklet free. W. Hillyer Ragsdale, Drawer 4, East Orange, N. J.

"SCHEMER Magazine," Alliance Ohio, prints big profit schemes; one subscriber making $25,000 from three; another $10,000 from one. Try your luck. Year, only $1.00; three months, 25c.

CHEMICAL Expert will furnish Formulas and Trade Secrets. All lines. Lists Free. W. L. Cummings, Ph.D., 228 Gordon Ave., Syracuse, N. Y.

ELECTRICITY Taught by experts; earn while you learn at home; electrical book and proof lessons free; your success guaranteed and position secured. Chicago Engineering Works, Dept. 51A, 2144 Lawrence Ave., Chicago.

CHEMISTRY

CHEMICAL Analysis. Chemical and Industrial formulas. Burson Chemical Laboratory, 227 West 4th, Ottumwa, Iowa.

CHEMICAL and bacteriological examinations guaranteed accurate. Formulas, processes. Write me about your chemical problems. List free. J. F. Mazur, M. B., 937 W. 29 St., Lorain, Ohio.

FORMULAS AND TRADE SECRETS

500 FORMULAS, 20c. Luminous paint—Resilvering Mirrors—Renewing dry batteries—Mechanics' Soap—Gas Tonic—Carbon remover. Puncture Plugger, 20c each. Entire collection, 50c. Ideal Book Shop, 5501FF, North Robey, Chicago.

"500 THINGS to Sell by Mail!" A valuable up-to-date compilation of fast selling suggestions, plans and methods. Prepaid, $1.00. Walhamore Company, Lafayette Bldg., Philadelphia, Pa.

1,000,000 FORMULAS. Trade Secrets, for Every Business, $2.00. Ideal Book Shop, 5501MF, North Robey, Chicago.

FORMULAS—Catalogue free. "Clover," 5501CF, North Robey, Chicago.

SOMETHING New. Will cut glass any thickness, any desired shape and design. Unlike a glass cutter this cuts right through as like cutting paper with shears. No machinery or chemicals needed. Very simple, valuable to glaziers, etc. Secret, $1.00. L. J. Richards, 866 Main St., Fitchburg, Mass.

AN opportunity to obtain a real valuable money-making formula for polishing autos and furniture. This is not a 25-cent or dollar formula proposition. Send 75 cents for test sample. A. Drelling, 3055 Salmon St., Philadelphia, Pa.

LUMINOUS Paint. Genuine formula sent on receipt of 50c. Money making painting gas and electric light chains, hangers, push buttons, clock-dials, statues, etc. L. J. Richard, 866 Main St., Fitchburg, Mass.

550 RARE Formulas for 25c (coin). We can furnish any formula wanted for 50c. Allen's Enterprises, 1227 Milwaukee Ave., Chicago, Ill.

ABSOLUTE Money Getters!—New catalog of novel, startling propositions free; postal will do. Fitzgerald Laboratory, Box 49-B, Stapleton, N. Y.

MY Surprise Collection, six big money-making formulas, 25c (no stamps). H. Rennacker, 358 Cherry, Meadville, Penna.

500 SUCCESSFUL money-making formulas and trade secrets for 50c. Postpaid. Rudolph Bjergaard, Rollag, Minn.

1,000,000 FORMULAS and recipes—1016 pages, $2.00. Englewood Book Shop, 7021A, South Winchester, Chicago.

ABSOLUTELY any formula. Satisfaction guaranteed. Price, $1.00. Robert Tyler, 256 Park, Newton, Mass.

FORMULAS worth buying. Literature free. Hager Supply, 509 28th Ave. So., Nashville, Tenn.

10,000 SELECTED scientific, chemical, technological and practical recipes and processes including hundreds of so-called trade secrets for every business alphabetically arranged in one large volume of 800 pages. Price, $4 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

FREE—Twelve Processes. Enclose 2c postage. Signs, 52 Levant, San Francisco, Calif.

FORMULA catalog free. C. A. Lutz, Apartment 464, York, Pennsylvania.

REMARKABLE Discovery—Positively removes tattooes, coal marks, moles; safe, sure, simple process. Original since 1918. Formula $1.00. Harding Co., 142 Dearborn St., Philadelphia.

FORMULAS of the better sort. Write for our free catalog. National Scientific Laboratories, 624 Main, Richmond, Va.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

AGENTS WANTED

AGENTS, Men or Women, full or spare time, earn $25.00 to $100.00 a week and be your own boss representing the Ho-Ro-Co Mfg. Co., manufacturers of the wonderful Ho-Ro-Co Tonic, the great blood purifier and system builder; some profit-maker. Ho-Ro-Co Medicated Skin and Scalp Soap for the baby, toilet, bath, skin and scalp; a repeater. Over 100 other fast-selling specialties, toilet preparations, perfumes, flavoring extracts, spices, medicinal preparations and household specialties. Every item a fast seller and a big profit-maker. Don't fail to ask for our free sample case offer. We furnish advertising matter and samples free of charge. Ho-Ro-Co representatives are successful. Write today. Ho-Ro-Co Mfg. Co., 154 Locust St., St. Louis, Mo.

WHIRLWIND money-maker for agents—sample free. Sell powdered Hanslick, an absolutely new, non-competitive, and unbeatable hand cleanser. Removes grease, grime, ink, paint, etc., without slightest injury to skin. Its use spreads like wildfire. Cheaper than all others. Sells in cans (or bulk with dispensers) to garages, autoists, mechanics, factory and office folks, to housewives, hardware stores and to auto supply houses. Huge quantities used weekly by mercantile houses. (Names on request.) Big repeat business assured. Exclusive agencies, crews working for you, fast sales, splendid profits and a permanent business for hustlers. Live ones can clean up $500 a month. Send 2c stamp for postage on Free sample. Complete sales plan goes with it. Write quick to Solar Products Company, 124 W. Lake St., Chicago, Ill.

$50-$100 WEEKLY—Whirlwind Seller. Klean-Rite. New Washing Compound. Women crazy about it. 300% profit. Premiums for customers. Distributing Samples Free. Write Quick. Bestever Products Co., 1941-K6, Irving Park, Chicago.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 624 Main, Richmond, Va.

AGENTS—Send for sample "Fretnot"—the washday wonder. Be convinced you can do a whirlwind business. You can clear at least $20 to $100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credits given. Don't call. P. M. Motter & Sons, 20 E. Jackson Blvd., Chicago.

WOULD $18 an hour interest you? Clarke made this selling amazing windshield cleaner; for autoists, motormen, engineers; works like magic; one rub keeps glass clear 24 hours; cleans entire windshield; works while you drive; chemical-felt sheds water like a duck's back; snappy metal holder fits pocket; guaranteed year; sells $1; $meet sold 2,000 few days; amazing details free. Security Mfg. Co., Dept. 622, Toledo, Ohio.

SALES Agents. Men or women. $240 a month. Steady employment. Take orders for Jennings New Guaranteed Hosiery for men, women, children. Written guarantee with each pair to wear and give satisfaction or new hose free. All styles. Finest silk hose. Low priced. Write for complete line of samples. Big money for spare time. Jennings Mfg. Co., Dept. 368, Dayton, O.

AGENTS—Earn $50 to $100 a week selling Marquette Tire Tool. Simple demonstration sells it. Removes tires in a jiffy. Every owner wants it. Thousands in use. Exclusive territory going fast. Agent's sample $1.25, retails at $2.50. Write for full particulars or send $1.25 for sample and particulars. Marquette Mfg. Co., Dept. A, 218 S. Wabasha Ave., St. Paul, Minn.

AGENTS—Sell articles which repeat and on which you can build up a permanent business. You can do it with "Zanol" Products, a high-class line of Soaps, Perfumes, Flavors, Coffee, Tea, Baking Powder and other Pure Food Products and Household Necessities. Write today for New Money-Making Plan. American Products Co., 5886 American Bldg., Cincinnati, Ohio.

DISTRICT Managers—Big profits. Men capable of organizing and managing crews of lady solicitors, can easily clear $50.00 to $100.00 per week with the B. & G. Protector, the original and best protector on the market. Every woman needs and buys it. Two grades. B. & G. Rubber Co., Dept. 155, 618 Penn Avenue, Pittsburgh, Pa.

AGENTS—We pay $9 a day taking orders for Insyde Tyres. Best and easiest seller ever put on the market. Guaranteed to give double tire mileage. Any tire. No punctures or blowouts. Every auto owner buys on account of low price. Enormous demand. Write quick for agency. American Accessories Co., B-678, Cincinnati, Ohio.

TERRITORY Salesmen—First popular price Fire Extinguisher ever made. Every home, garage and office can be sold. $90 a week can be made. No capital or experience necessary. You take orders, we deliver and collect—pay you daily. Write for territory. Thurston Mfg. Co., 278 Foe St., Dayton, Ohio.

AGENTS Wanted—Brand new article with wonderful sales possibilities. Applicants must be big enough to handle County rights on exclusive basis. Our contract assures you a permanent and substantial business. Sample fifty cents. Money refunded if we do not connect. Dept. 21, Bethlehem Utilities Co., Bethlehem, Pa.

AGENTS, $8 a day. Take orders for Blue Ribbon Cutlery Set. Stainless steel. Aluminum handle. Guaranteed. We deliver and collect. Pay you daily. Big demand. Easy to take orders. No capital needed. Write for sample outfit. Parker Mfg. Co., 378 Awl St., Dayton, Ohio.

LIBERAL Commissions for Selling Advertising Thermometers made by the world's largest manufacturers of thermometers. Profitable proposition for energetic men. Liberal commissions. Write, giving past employment and references. Only a few more men needed. T. B. Div. Taylor Instrument Companies, Rochester, N. Y.

MIAMI, Florida: The World's fastest growing city. Wealth, Climate. Tuckerman & Snare.

$100 REWARD will be paid to the first person who proves that the Keystone Economizer fails to save 25% to 50% of any car's ordinary gasoline consumption and entirely eliminate carbon. This is a bona fide offer. The Keystone Economizer is a real gasoline saver which has made good. Results Guaranteed. More mileage, more power, less cost. Fits any car. Easily attached. Saves its cost in a month. $4 postpaid. Splendid offer for factory representatives, agents and salesmen. Write or wire for particulars to Keystone Economizer Co., Stock Exchange Bldg., Los Angeles, Calif.

AGENTS, Salesmen—Get distributing contract for "Lightnin' Gloss," new refinisher for automobiles. No polishing or rubbing. Dries dustless 30 minutes. Permanent gloss. Wonderful seller. Retails $1.50. Get busy. Big profits. Makes old cars new. Address, Lightnin' Gloss Co., Wichita Falls, Texas.

AGENTS—$50 a week taking orders for guaranteed hosiery for men, women and children. Must wear 12 months or replaced free. All styles and finest line of silk hose. Write for sample outfit. Thomas Mfg. Co., Class 262, Dayton, Ohio.

AGENTS—$100 Weekly. New invention for all automobiles. You're backed by reliable concern in business for over five years. Products positively guaranteed. Honesty, Quality, Service, our motto. If you're sincere, write at once. Ovee Mfg. Co., Dept. 180, Louisville, Ky.

"THE Mucilage Fountain Pen"—Carry in pocket with your fountain pen. No sticky fingers. Lasts lifetime. Never dry. Handy office or home. Sample 50c U. S. stamps. Agents wanted. Liberal terms. Jax Co., Box 292 Steger, Ill., U. S. A.

SELL CurManCo—Two Changeable Signs in One. Every storekeeper buys two and three at 200% profit to you. Nothing like it. You will want nothing better to sell this year. Currier Manufacturing Company, 29 Minneapolis, Minn.

PORTRAIT Agents—Earn big money selling our Photo Medallions. Everybody buys. You charge $3.00; make $2.40 each sale. $10 daily easy. Big variety designs. 4-day service. Perry Photo Novelty Corporation, Section 16, 360 Bowery, New York.

STARTLING Agents Proposition—$100 weekly selling Rolly's Washday Wonder, New Chemical Dirt Solvent, Harmless, Cleans without rubbing. Enormous profits. Repeat orders assured. Experience unnecessary. Territory going fast. Samples free. Rolly Chemical Co., A1, Hastings, Neb.

BIG Money—Broken arms, cranking accidents prevented by Non-Kick Device for Fords. Burnett sold 144 in two weeks; made $216. Write for particulars—exclusive territory. Non-Kick Co., 717 Central, Kansas City, Mo.

AGENTS—Cost $5—Your Profit $89.50, transfer monograms on autos, trunks, bags, furniture, etc. No experience, no license. Write for free samples. Globe Monogram Co., Inc., Dept. P, 244 Market St., Newark, N. J.

TEMPERED Copper? 80% Copper Chisel. Cuts Steel. Unaffected by Heat. Big Seller. Send 25c for Agent's Sample and Full Particulars. Wm. J. Eberle, A. M. & M. Bank Bldg., Milwaukee, Wis.

AGENTS Coining Money selling Universal Gas Saver for every gas stove. Wonderful device. Cuts gas bills in half. Big profits. Write quick. B. C. Moore, Gas Saver Co., Topeka, Kansas.

SOMETHING Big—Dime puts you on our mailing list one year. You receive latest money-making opportunities, propositions, from manufacturers and supply houses everywhere. Kentucky Agency, Covington, Ky.

AGENTS and Distributors wanted to sell our Radio-Gaslighters. 25-cent sellers, $9.00 per gross. Universal demand. Write for proof. Ignition Products Company, Inc., 12 Union Square, New York.

CAPS made to order. Latest styles. The newest agents' idea out. Undersell stores. $10.00 daily easy. Armstrong Cap Factory, 210 Superior Ave., Dept. 70, Cleveland, O.

YOUR Opportunity—Big money. Sell our Brushes. Best quality. Lowest prices. Wonderful variety. Homes, Offices, Hospitals, Apartments, Garages, Large Users. Write Springfield Brush Works, Springfield, Mass.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 624 Main, Richmond, Va.

TEN Dollars daily easy selling Klenzall. Washes clothes without rubbing. 300 per cent profit. Sale first order guaranteed. Free samples. Quality Products Co., Altoona, Pa.

AGENTS—Buy direct from manufacturer quickest sellers at lowest wholesale prices. Big profits. Unquestionably best proposition ever offered. Write today, National (27), Woodhaven, N. Y.

300% PROFIT. Snap Laundry Crystals. The modern washing wonder. Bigger and better. Exclusive territory. Sample and particulars free. Snap Products, Dept. X, Rochester, N. Y.

300% PROFIT selling Gas and Cigar Lighters. Lights without matches or friction. Sample 25c. Pocket Size. Rapid Mfg. Co., 10 E. 14th St., New York, N. Y.

AGENTS Wanted to sell the latest self-selling novelties. Territories for live ones. Sample 10c. Dept. A, R-D-K Novelties Co., 1429 Lexington Ave., New York.

$15.00 DAILY Easy selling the New Amberoid Unbreakable Combs; kind you can hit with a hammer; write for wholesale prices. Oliver Gandy, Crisfield, Md.

AGENTS—Mason sold 18 Comet Sprayers and Autowashers one Saturday. Profits $2.50 each. Particulars free. Established 30 years. Ruler Co., Johnstown, Ohio, Dept. D.

AGENTS — German Barber Razors. World's best make. Money back guarantee. Dozen $14.00. Single sample $1.50. Money order. Address Berg Co., Times Building, New York, N. Y.

A BUSINESS of Your Own—Make sparkling glass name plates, numbers, checkerboards, medallions, signs; big illustrated book Free. E. Palmer, 511 Wooster, Ohio.

300% PROFIT—Every Home, Store, Office and Garage Needs. Easily carried, quickly sold. Free sample. Address Chapman Company, 839 Dwight Bldg., Kansas City, Mo.

200 PER Cent Profit selling "Shyncloth." Makes all metals look like new, quickly. We guarantee sales. North Texas Supply House, Weatherford, Texas.

MOST Wonderful Seller. 96c profit every dollar. No stock to carry. License unnecessary. Sample free. Mission, 2421-MP, Smith, Detroit.

CHEVROLET Anti-rattler for gear shift lever. Sells on sight. Send 25c for sample. Prottco, 972 Hoover St., Los Angeles, Calif.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money; new stuff. Big profits. Catalog free. Mission, 2421-PM, Smith, Detroit.

SHOP Agents—Live men to distribute our Machinists' Tools. Good commission. Perdieu Tool Mfg. Co., 526 16th Ave., Milwaukee, Wis.

AGENTS Wanted to sell the only and latest real pocket pencil Sharpener. Sample mailed 25c. Fred Voogt, West Frankfort, Ill.

COUNTY Distributors wanted throughout country for Household necessity. 100% profit. Sizz Chemical Co., P. O. Box 1151, Indianapolis, Ind.

AGENTS—Everywhere. Fifty thousand men to sell every housewife and laundry in the United States the newest "Labor Saving Laundry Device." Nothing like it in the world; easily demonstrated; sells on sight; Money Back Guarantee. Big Commission and bonus. Exclusive territory. Mail $1 for sample and particulars. Barrett Iron Stand Company, 1340 Broadway, New York.

AGENTS—Sell Real Solid, 99% pure and seamless Aluminum Ware. Put up in sets or single pieces. Big money for the hustler. Aluminum ware is a repeater and builds you a business. We have several other money-making lines for agents. Write for circulars. H. C. Aluminum Co., Fredericksburg, O.

AGENTS—Don't overlook our proposition on page 146. C. B. Haven Co.

$31 YOUR Clear Profit With Only $1.50. Selling Pure Gold Leaf Monograms for Automobiles, Trunks, Bags—Window and Wagon Letters. Applied Instantly. No experience necessary. No. 1 Outfit brings you $32.50—Cost only $1.50—You make $31.00 profit. Get Colored Catalog. Full Particulars, Free Samples (36 Designs). "Hurry." Nulife Auto-Aid Corporation, Hartford, Conn.

TAILORING agents wanted to sell guaranteed tailor-made suits and overcoats. We ship free prepaid, large traveling sample outfit, 250 all-wool fabrics at $15.00 and up for guaranteed suit or overcoat. Write today for fall and winter samples. Jay Rose & Co., 411 S. Wells St., Chicago, Dept. 500P.

IMMEDIATE Commissions—no investment—no delivering—no collecting. Pay-day every day. Profits larger than usual. That's our proposition No. 1. For the agent that buys to resell—our proposition No. 2 would instantly appeal. 100% profit and Free Goods. High grade guaranteed aluminum cooking utensil specialties and staples. Our Free Goods Offer is unusually interesting. We maintain a 24-hour shipping schedule. Exclusive territories granted and protected. Get yours before it's too late. Perfection Aluminum Mfg. Co., Desk A., Lemont, Ill.

AGENTS: The kitchen, not the front porch, is where sales are made. The Martin Plan takes you right in. It secures and holds the housewife's attention; makes every call count. A splendid proposition itself, but helps introduce your regular line if you carry one. Novel, original, profitable. Complete plan and sample of fast seller only 20 cents. Stamps will do. Money-back guarantee. Address The Martin Agency, 214 West 34th St., New York City, N. Y.

AGENTS calling on motorists and garages make $100.00 weekly selling original Tire-Doh. 12 years the leading repair for auto tires. No heat—no tools—repairs punctures permanently in 2 minutes at cost of 2 cents. Send 40 cents for big $1.00 outfit. Money refunded if not satisfied. Write at once for full particulars. Atlas Auto Supply Co., 652 W. Austin Ave., Chicago.

AGENTS to demonstrate and sell to car owners. Nationally advertised auto polish that removes that dull gray film, restores the factory lustre, and leaves a glass-hard, dust-proof surface. Thousands of instances prove quick sales result from demonstrations, and steady growth of profits from repeat business. For free testing sample and details, address C. S. Manfg. Co., 502 N. Whittier, St. Louis, Mo.

AGENTS: Make $75.00 a week selling our strictly All-Wool made-to-measure suits at $26.50. You collect profits in advance and keep them. We supply finest selling outfit in America. Many exclusive money-making features. Tailoring, raincoat and side-line men, part or full time, get in touch with us immediately. Address Dept. 101, Goodwear, Inc., 843 W. Adams St., Chicago.

LARGE profits selling Spee Dee. The marvelous hand cleaner. Washes hands without water—no grit, acid or lye. Every motorist and mechanic, garage and factory buys on sight. Quick repeat orders roll up your profits. Send 20c to cover postage on big 27 ounce can. Write for particulars at once. States Chemical Co., 652 W. Austin Ave., Chicago.

AGENTS—To sell universal vise attachments that have exclusive features and used by plumbers, steamfitters, automobile garages and manufacturing plants. Affords big profits. Fully guaranteed and very easily sold. Samples, advertising matters and territory free to live agents. Address the Universal Equalizer Company, 8 E. Pearl St., Cincinnati, O.

MEN and Women are now making big money with our new proposition selling high-grade line. Everybody uses it. Wide selection. Continuous repeater. New fast selling "leaders" that are in big demand. Quick sales and splendid profits. Write today. The Pioneer Soap Co., 35 St. Paul Ave., Dayton, Ohio.

$5 TO $15 daily introducing new style guaranteed hosiery; must wear or replace free; no capital or experience required; just show samples; write orders. Your pay in advance; we deliver and collect; elegant outfit furnished, all colors and grades, including silks. Mac-O-Chee Mills Co., Dept. 106, Cincinnati, Ohio.

BE our part time shoe agent in your locality. Pleasant work, good earnings. Sell from our catalog to wearer. We send shoe book with your name on front cover direct to your customers. For particulars address Tanners Shoe Mfg. Co., 116 South St., Boston, Mass., Dept. 15.

MAKE $50 Daily. Something New! 400% profit. All business, professional men need it. Sells $5. Costs $1. Brooms, Texas, sold 20 first day, profit $80. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample outfit free. Federal Association, 71-K Asylum St., Hartford, Conn.

BIG Money Makers. Large factory offers you big profits on 150 fast sellers. Toilet gift sets, flavoring extracts, remedies, soaps bring you $8.00 to $25.00 daily. Howe of Illinois makes $4.00 an hour. Sample outfit free to workers. Lincoln Chemical Works, Dept. 155, 2956 No. Leavitt, Chicago.

SELL Minitmend for tires and tubes—cost 2c. Repair; surpasses vulcanizing, saves 500%. Every auto and accessory dealer buys. Profits amazing. Shaw made $21 first day. Hart $155 first week. Particulars and free sample. The Colonial Rubber Co., Dept. 85, Philadelphia, Pa.

AGENTS—Make 200% profit selling only device for cleaning Carpet Sweeper and Vacuum Cleaner brushes, mops, etc. Sell every housewife. Exclusive selling rights to live wires. Sample, 25c. Den-Wal Sales Co., Dept. C, 189 Market St., Newark, N. J.

FORD Driver Agents—New, patented, ThermOcone Vaporizer. Installed three minutes. Wonderful results instantly. No dissatisfied users. Sells Five Dollars. Lasts lifetime. No adjustments. Money-back guarantee. Endorsed by leading Engineers-Motor Manufacturers. T. B. Funk Co., Indianapolis, Ind.

A DISCOVERY destined to revolutionize Tire Industry. Only practical air-filled puncture-sealing inner tube. Fully guaranteed. Autoists buy on sight. One sale sells another. $100 weekly. Experience or capital unnecessary. A. Wenstone, 3025 Indiana Ave., Chicago.

PICTURE men ask how to get your prints at cost. Our plan is easy. United Print Co., Sta. D., Chicago, Ill.

PORTRAIT Agents—$50,000 is what "Picture Man Friedman" made canvassing. Free circular "Profits in Portraits" tell how. 24-hour service prints, finished portraits, frames. Samples free. "Picture Man Friedman," Dept. 8, 127 N. Dearborn St., Chicago.

MANUFACTURE something new with our guaranteed solid metal outfit; makes article 7½x3 costing 1c, sells 10-25c, outdoor and indoor, like wildfire; price $7.50 with instructions; sample 25c. New Jersey Specialty Co., 16 Bergen Sta., Jersey City, N. J.

PORTRAIT Agents—$50,000 I made canvassing. Free circular "Profits in Portraits" explains how. 24-hour Service Prints, Portraits, Frames. I finance you, guarantee delivery. Samples free. Write today. Friedman's Studio, Dept. 8, 127 N. Dearborn, Chicago.

AGENTS—Men and Women—We start you in a permanent business without any investment. Whole or spare time. Big line, easy sales everywhere. Handsome profits. No experience necessary. Write now. National Mfg. Co., B-33 West Hoboken, N. J.

LIVE Agents Wanted. New device, designed to fill a known demand. Sells for $2.50. Agents get $1.00 commission on all sales and resales. Sells on sight. M. & S. Mfg. Co., Box 934, Hartford, Conn.

AGENTS—$5 to $10 daily selling Snow Dust Washing Compound. Washes clothes without rubbing. Women wild about it. Big repeater. Free samples boost sales. Exclusive territory. 300% profit. Sample free. Norman E. Conrad, Wabash, Ind.

THE only practical auto-cover on the market. Covers or uncovers your car instantly. Unlimited possibilities. No competition. Dealers and public garages everywhere interested. State territory wanted in first letter. Beard Manufacturing Co., Hardinsburg, Ky.

PROTECT Your Rights. Write for Record of Invention which contains form to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Reaney Kelly, 612 G. Columbian Bldg., Washington, D. C.

PORTRAIT crews get our rock bottom prices on finishing. Service Art Sta. D., Chicago, Ill.

PROFITABLE side line for salesmen calling on banks and financial houses. Several states still open. Give particulars of lines now selling and itinerary. Mercury Bronze & Embossing Co., 126 West Third Street, Los Angeles, Calif.

EASY Money—$18 daily—Something new. "Simplex" Ironing Board Covers. Remarkable invention every woman buys on sight. New agent sold 100 first two days (profit $75.00). Write quick. W. J. Lynch, Springfield, Ill.

AGENTS: Make $50 to $100 weekly selling our rebuilt typewriters. All standard makes $15.00 up. Guarantee five years. One month free trial. Send for agents' proposition. Typewriter Exchange, Wholesale Dept., Fordham, N. Y.

AGENTS: See our display advertisement on page 128 in this magazine, then write us immediately. Wide awake agents need no other line. Address, Sales Dept., The Kaxo Company, Cambridge, 39, Mass.

AMBITIOUS Agents are coining money manufacturing and selling Orange Blossom Shampoo. Pleases particular customers; repeat orders assured. Materials obtainable anywhere. Machinery unnecessary. Interesting booklet free. Address Norman M. Ovri, East San Diego, Calif.

CHAFFIN Polishing Cloth cleans without scratching. 25c seller. 150% profit, $10 daily easy. Every housewife buys one to three. Free sample demonstrator. Chaffin Products Co., 5511 Euclid Ave., Cleveland, Ohio.

WONDERFUL Fast Seller; new auto device makes tools, etc., accessible without removing cushion. Retails $2.00. Agent's sample, $1.00. Act quick for territory. E. C. Whiting, 294 Washington St., Boston, Mass.

AGENTS—Investigate. Big money taking orders. Guaranteed Electric Hot Plate. We deliver and collect. Pay you daily, full or spare time. Lentz Specialty Co., Box 3, Highland Park, Detroit, Mich.

AGENTS—Build substantial business selling article that steadily increases and repeats. Territory being rapidly assigned. Write for particulars today. The Zeeta Company, Inc., Dept. 18, 1819 Broadway, New York City, N. Y.

AGENTS: Something new. Wireless guaranteed umbrellas. Adjust new top in minute. Handles collapse to fit suit-case. Other features. Popular prices. Free sample. Parker Mfg. Co., 278 Dike St., Dayton, Ohio.

SALES Agents for exclusive county representation on Dico spark plugs. Hustlers make $60.00 and better weekly. Every car and tractor user a prospect. Write quick. Dayton Ignition Co., Dayton, Ohio.

ALUMINUM Brush Agents. Aladdin Polish for aluminum and other metals; highly profitable side line. 30c-$1.00 sizes for homes and public places. Sample, 4c. Address Texply Co., Somerville, N. J.

MEN'S shirts. Easy to sell. Big demand everywhere. Make $15.00 daily. Undersell stores. Complete line. Free samples to workers. Chicago Shirt Co., 9 So. Clinton, Factory 205, Chicago.

TAILORING Agents Wanted—Make $50.00 to $100.00 and more per week, selling our wonderful all wool one price line. Suits sell for $29.50. None higher. Retail stores ask at least $50.00 for the same quality. Also strong line of featherweight fabrics to sell at $16.75 per suit. You collect your profits at once. We ship C. O. D. to customer for balance. We furnish beautiful 6x9 swatch outfit and powerful co-operation. Hustlers write at once. Salesmanager J. B. Simpson, Inc., Dept A-112, 831 West Adams Street, Chicago, Ill.

WANTED—Men to sell Lawn Mower Sharpener. Sample $2.00. Simplex Sharpener Co., Dept. A, 819 Goodwin Street, Peoria, Ill.

WANTED. Representatives in every county to sell the Statyte. Every chair owner a prospect. Exclusive territory. Liberal commission. Sample 50 cts. Address Foss-Fischer Mfg. Co., Coldwater, Ohio.

TWO Real Money Makers. Self-threading needles. Needle books cost 5c, sell at 15c. Send for samples. Atlas Needle Works, Box 1888, Madison Sq. Sta., New York, N. Y.

SALESMEN: $100.00 and commission to sell guaranteed cord and fabric tires direct from factory at lowest prices. Goodstock Tire Company, 1100 South Michigan Avenue, Chicago, Ill.

WIRE twisted sanitary Brushes-Mops, Dusters, Automobile Brushes, etc., are the leaders in specialties. Restricted territory for live wires. Steelast Brush Co., 487 Broadway, N. Y. City.

VINOBAR Co., 536 Washington St., San Francisco, Calif., sole manufacturers. Exceptional proposition. Food beverage. Exclusive territories. New invention. Different, unusually attractive, repeater. Sample, $1. Big profits.

AGENTS: Big profit selling our up-to-date Radio books. Write for agents' proposition. Norman W. Henley Publishing Co., 2 West 45th St., New York.

SALESMEN can sell our tools to every hotel, because they pay for themselves first time used. Address J., 1040 Georgia St., Los Angeles, Calif.

WANTED: Experienced agent to organize crews to sell standard automobile equipment. Big money to right man. Paul G. Towsley, Ashton Bldg., Grand Rapids, Mich.

SOFT Drink Extracts, Non-alcoholic flavorings, Toilet Preparations, best agents' proposition for men or women selling housewives direct. Fletcher Production Company, 415 E. 69th, Chicago.

PURE 23-karat gold leaf and many other styles of entirely new window sign letters. Boston Window Lettering System, 210 Dover St., Boston, Mass.

AGENTS—We are glad you saw this ad. Wonderful seller, sample of actual size, 25c. Don't miss answering this ad. Rovin, 801 Breitmeyer Bldg., Detroit, Mich.

SOLD man-to-man. $40,000 formula. Imported horse-hide razor sharpener. Show sample, sale sure. Neat case. County rights. Success insured. Habanix Company, Toledo.

AGENTS Wanted—Salary or commission for demonstrating and selling our Marvel Can Opener and other specialties. Staples Mfg. Co., Box 289, Mt. Vernon, Ind.

TWENTY good propositions for wide-awake agents. There is one to suit you. Particulars free. The Lawrence Products Company, Dept. M, Beaver Dam, Wis.

START Little Mail Order Business anywhere. Home employment evenings. Everything furnished. Stamp brings Instructive Booklet. E. Pier, 72 Cortlandt Street, New York, N. Y.

FISHER Safety Steering Device "Makes a Ford Drive like a Packard." Agents wanted every county. Good money. Fisher Sales Co., Lincoln, Nebr.

EARN $10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads. Outfits furnished. E. Decie Laboratories, 286 Fifth Avenue, New York, N. Y.

AGENTS: Make $1 hour, selling useful 15c article. Every housewife buys. Big commission. Jerome Mfg. Co., 25 East 99th Street, New York.

QUICK Seller—New auto accessory. Fits any car. 65c retail. Agents' delight. Indispensable Products Co., 1757 N. Whipple St., Chicago, Ill.

AGENTS—Just out "No-Sag" attachment for screen doors. Big profits, sample 25c. Mfg. by Anderson & Co., North Easton, Mass.

WORLD'S Fastest Selling Auto Accessory! County Distributors wanted; write today. G. L. W. Spring Oiler Co., San Diego, Calif.

AGENTS: Lowest-Priced Gold-Leaf Window Letters. Free Samples. Address Liberty Letter Co., 77 Chapel St., New Haven, Conn.

"AGENTS sell used clothing; make $10.00 to $25.00 day easily. New wholesale method. Crosby Co., 609 Division, Chicago."

"BLADEKNIFE" means genuine pocket knife from any discarded blade. Sample twenty cents. Address, L. L. Martin, Paterson, N. J.

AGENTS, sell new Neutral pedal for Fords. Big seller. For literature, write Burnham-Cote Co., Holyoke, Mass.

17c PROFIT on 25c sale. Two new fast sellers. ABC Manufacturing Co., Box 1715B, Washington, D. C.

THE Agent's Guide—Tells where to buy almost everything. Copy 10c. Wilson Publishing Co., 1400 Broadway, New York.

SHEEP wool polishers, cleaners, dusters, 100% profit. Home, commercial, auto use. Bennington Duster Co., East Boston, Mass.

$30.75 PROFIT on $2.50 outfit; gold initials for automobiles, etc. Write National, Station D, Brooklyn, N. Y.

AGENTS Wanted—Big money in selling artificial flowers. Lotos Manufacturing Co., 1734 N. Halsted St., Chicago.

SELL Ladies' Art Embroidery Needle. Sample 50 cents. Eugene Marquis, 5200 North Keystone, Indianapolis, Ind.

BIG Profits. Fast sales. Every housewife buys. Polishing cloths. Pease Supply Company, Keene, N. H.

AGENTS, $100 weekly with latest invention. Raymonds Manufacturing Co., 31 East 132nd St., New York.

AGENTS—Don't overlook our proposition on page 146. C. B. Haven Co.

GOOD prices paid for butterflies, insects. See Sinclair's Display Advertisement, page 27.

AGENTS—Don't overlook our proposition on page 146. C. B. Haven Co.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 624 Main, Richmond, Va.

NEW Garter, Patent Pending. Free sample. Art Co., 513 North Dearborn, Chicago.

"HOW to Sell Patents" free. Patent News-O, Washington, D. C.

MANUFACTURERS Agents—District Managers—Crew Managers—Get immediately our proposition. Mother Goose Wringer Mop—New, Patented, Perfect. Saves the back—Housewife stands erect to do all scrubbing—Hands never touch the water. Retail $1.50. More than 100% profit. Sample prepaid $1.00. We had to double size of factory last year to handle the orders. You can make a small fortune. The Alline Company, 6523 Euclid Avenue, Cleveland, Ohio.

AGENTS—Enormous profits selling Genuine Gold Leaf sign letters. Guaranteed not to fade. Establish a permanent business or travel. Anybody can do it. Free samples. Guarantee Sign Service, A 430 South California Ave., Chicago.

AGENTS—Easy, quick sales. $60 to $100 weekly. Valuable free premium to every customer. You write orders. We deliver and collect. Commissions daily. No capital or experience. Wonderful new solid aluminum handle, big cutlery set, sells itself. Best year-round proposition. Sample outfit free. Also free Ford car offer. New Era Mfg. Co., 803 Madison St., Dept 21, Chicago.

EVERPLAY Phonograph Needle plays 27,000 times. Better tone and reproduction. Preserves records. Fits all phonographs like ordinary needle. Not a jewel. Point renewed as used from 9 inches of soft special alloy wire coiled within the needle. Saves $40. Retails $1.00. No dealers to buck. Big profits. Everplay, 1 McKay Bldg., San Francisco, Calif.

AGENTS: We want agents to sell our Guaranteed Batteries for Automobile Starting and Lighting; our Batteries are right in quality and price. (Ford size sells for $16.00.) We will furnish you instructions for installing, and pay you a good commission. Box 96, Defiance, Ohio.

MOTOR Ignition Amplifier—A Wonder Invention! Gives new power to an old motor and more power to the new. Sell to garages, accessory dealers and users. Quick action, big money and satisfaction. Write for prices and literature. Motor Ignition Corporation, Mfgrs., Albany, N. Y.

BIG Profits Selling New $3.50 Automatic Adding Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily easy. No competition. Pocket size. Business people everywhere positive customers. Thousands being sold. Tremendous demand. Here's high-grade money-maker. Bassett Co., 1458-D, Hollywood Ave., Chicago.

HIGH-GRADE agents for entirely new accessory for any automobile. Makes night driving safe. Can carry in pocket; every car owner buys. Fits any make. Men who can stand big profits and stay on job. Ray Auto Flitter Company, Marion, Ind.

AGENTS coining money with our women's household aprons and other rubberized goods; children's aprons, pinafores and sunbonnets, utility bags, etc. Best goods made at least prices. Write for catalog 11. The Schafuss Corporation, 466 Broome St., New York, N. Y.

SALES Representative wanted every county to give all or spare time. Position worth $1,200 to $3,000 yearly. No previous experience or capital necessary. Write for full particulars. A. A. Silver-Chamberlin Co., Clayton, N. J.

SELL Mengo Stictite Patches for tires and tubes. Every Auto Owner and Dealer buys. Appoint Sub-Agents. Exclusive territory. Sales Plan and Free Sample. Mengo Products Co., 533 Rosedale, Pittsburgh, Pa.

SIGNS for stores and offices. Entirely new. $50 week easily made. Chicago Sign System, F150 W. Austin Ave., Chicago.

WANTED—Agents and Salesmen to handle Europe's Famous Wonder Glass, the newly imported Prism "Binoculette." For theatre, hunting, yachting, races, touring, aviation, etc. This is the smallest and of its size the most powerful Glass in the world. Can be carried in vest pocket or ladies' bag. Retails at $25.00. Confidential wholesale price to agents $12.50. Send money with order to George Mayerle Optical Co., General Importers, established 1894, 960 Market St., San Francisco, Calif. (Send for catalog.)

3 IN 1 Bags, $5 per dozen. Sells for $1.25 each. Send 50c for sample. Write for catalog of 100 sure sellers. Economy Sales Co., Dept. X, Boston, Mass.

CABBAGE Cutter, 5 knives, slices 20 vegetables, like aluminum, don't rust, never dulls, 20,000 users Cincinnati alone, endorsed by Good Housekeeping Institute. Sample 48c. Meyer Co., Orland Ave., Cincinnati, Ohio.

AGENTS—Sell Our Marvel Can Opener. Make $4 on every $2 invested. Our tip—your opportunity. Write us now. Staples Mfg. Co., Mt. Vernon, Ind.

SELLS like hot cakes; big profits; new ironing wax; perfumes clothes with lasting violet perfume. Working outfit 10c. Yankee Manufacturers, 380 Atlantic Ave., Brooklyn, N. Y.

LATEST, niftiest, simplest folding automobile and camping stool ever devised. Sells also like wildfire at parades, public gatherings, etc. 100% profit. Mincke, Alhambra, Calif.

AGENTS Make $1.50 on every shirt order from manufacturer direct to wearer. Menzin Shirt Co., 3863 3rd Ave., New York City.

$10 DAILY Easy with my specialty. 500% profit. K. Home, 1957 Warren, Chicago.

"GLARESCOPE"—New auto accessory, just out, nothing else like it on the market; $15.00 to $20.00 daily easy; retails at $2.00. Write for exclusive proposition. American Reflector Co., Hammond, Ind.

AGENTS—Unusual opportunity. Handsome profit to live agents. Every autoist convinced by demonstration. Write today for attractive proposition. Address Blasdel Products Co., 4319 McPherson Ave., St. Louis, Mo.

EXTRACT Men: Sell Vanilla, Lemon and Orange in bulk at one-half price. Wonderful goods. Profit 200%. Address Trask, Manufacturer, Temple, Maine.

$25.00 REWARD paid for any Corn Great Christopher Positive Corn Cure cannot remove. Also good for Warts, Bunions, Moles and Callouses. Price 35c. Particulars free. Reliable Specialty Corporation, Buffalo, N. Y.

AGENTS make $50.00 weekly selling Yankee Wringer Mop; sample free. Scheff Co., 2248 North Ave., Chicago.

AGENTS: Men and women, in spare or full time, make big money selling household necessity. Every home a prospect. Quick sales, big profit. Territory open. Write for particulars. Judd & Leland Manufacturing Company, Box 21, Clifton Springs, N. Y.

AGENTS—Sell Patented Cigar Lighters and Cigar-Case Moisteners. Big Profits. Start making money at once. Write for circulars, cuts and sales plan. Drake Mfg. Co., Dept. M., Milwaukee, Wis.

MEN or Women—Enormous Profits selling Duo Guaranteed Products. Easy Sales at every house. All or spare time. Big repeaters. Write Quick. Duo Co., Dept. Y-1, Attica, N. Y.

SELL Pudding Powders—Delicious dessert. Fast sellers; quick repeaters; big profit. Send for terms and sample. C. H. Stuart Co., 75 Broadway, Newark, New York.

AGENTS—Sell Electric Body Batteries for Nervous Diseases and Rheumatism. Nealeigh & Co., Indianapolis, Ind.

EVERYBODY uses Extracts. Sell Duo Double Strength Extracts. Complete line necessities. Big repeaters. Write today. Duo Co., Dept. F-1, Attica, N. Y.

AT Last—World's Greatest Adding Machine. Almost human. Retails $15; work equals $300 machine. $500 monthly easily made, demonstrating to stores, offices, garages, factories. Simple, easy; adds, subtracts, multiplies, divides, automatically. Speedy, accurate, durable, handsome. Five year guarantee. Tremendous demand; amazing profits. Liberal trial offer. Protected territory. Write quick. Lightning Calculator Corp., Dept. F, Smith Bldg., Grand Rapids, Mich.

AGENTS Sell Neverfail Iron Rust and Stain Remover. Huge profits. Big line. Sample. Write today. Sanford Beal Co., Inc., Newark, N. Y., Dept. 6.

AGENTS—Advertising Pencils, ready sellers, excellent sideline. Write for proposition. North American Pencil Works, 310 So. Canal St., Chicago.

AGENTS—$60-$200 a week. Free Samples. Gold Sign letters anyone can put on store windows. Liberal offer to general agents. Metallic Letter Co., 431-C N. Clark St., Chicago.

GALLAGHER made $336.00 in one week selling guaranteed Collection Systems, used by all business men. Sayers Mfg., 2815 Sheffield Ave., Chicago, Ill.

BIG profits. Sell Plate Glass Wind Deflectors, Rear View Mirrors, Aluminum Foot Scrapers and 20 nationally advertised accessories. Car owners, Dealers, Garages buy one to gross. Write quick for illustrated catalog and agency prices. Rapid Sales Corporation, 11-D Grand Rapids, Michigan.

POLISHING Cloth — great seller — big profit. Get our proposition. Newton & Co., 19 Main St., Newark, N. Y.

FREE Sample "Rain Shield Wiper." Retails $1.00—Costs You 25 Cents (300% Profit). Every Autoist Buys Quickly. No Cloth. No Paste. No Mechanical Attachment. (1) Rub keeps Windshields clear 48 Hours against Rain, Snow Storms. Invention Just Out. Prevents Accidents. (Williams makes $12 Hour.) Experience Unnecessary. Wonderful Pocket Sideline. Write Quick for Your Free Sample. Nu-Life (B) Corporation, Hartford, Conn.

100% PROFIT selling our felt rugs to homes, hotels, offices, etc. Everbody buys. We are manufacturers, not jobbers. Prices defy competition. $75 week easy. Newark Felt Rug Company, 56-C Bergen Street, Newark, N. J.

SOFT Drinks In Powder; ten kinds. Just add cold water and sugar; no trouble. Fine for the home, picnics, parties, dances, etc. Many make $10 to $50 day. Ten-glass package, best drink you ever tasted, and particulars 10c postpaid. Morrissey Company, 4403-11 Madison St., Chicago.

AGENTS: 1922's Greatest Sensation. 11-piece toilet article set selling like blazes at $1.75 with $1.00 dressmaker's shears free to each customer. Line up with Davis for 1922. E. M. Davis Co., Dept. 506, Chicago.

PLYMOUTH Bags. We are selling this popular bag in green, black, blue and brown leatherette, cretonne lined. $6-$6.50-$7.20 and $10 per dozen. Sample 65c prepaid. Write for free samples of material. E. Condon, Mfg., 12 Pearl St., Boston, Mass.

LIVE Agents make $10 Day selling Eureka Strainer and Splash Preventor for every water faucet. Takes on sight. Widely advertised and known. Get details today. A. B. Seed Filter Company, 73 Franklin, New York.

MAKE 600% Profit, Free Samples. Lowest priced Gold window letters for stores, offices. Anybody can do it. Large demand. Exclusive territory. Big future. Sideline. Acme Letter Co., 2800-D, Congress, Chicago.

SELFOLITE—Agents, Streetmen—Selfolite lights any fire while user sleeps, or any time. Performs surprising stunts. Newly patented. Sample 25c, postpaid; money back. Particulars. Kaytwo Mfg. Co., C195 Station A, Boston, Mass.

AGENTS: Big Profits. Genuine Gold Leaf Window Letters anyone can put up. Scripts and 57 varieties. Chicago Agency Co., 842 Altgeld St., Chicago.

$1,000 PER man per county. Get yours. Inexperienced men pulling down star salesmen's profits. Write for proof: How farmers, ministers, clerks—men in all walks of life—made big money in whole or spare time. You can do it. Amazing proposition—wanted everywhere. Exclusive territory—no sales limit. A hot or cold running water bath equipment for any home at only $7.50. Self-heating. No plumbing nor water works required. Investigate. Terms. Send no money. Write letter or postal today. Allen Mfg. Co., 654 Allen Bldg., Toledo, Ohio.

PORTRAIT Agents—A new portrait, something entirely different. Write for particulars, also catalogue and price list. Fidelity Portrait Company, Dept. 100, 3047 Harrison St., Chicago, Ill.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 624 Main, Richmond, Va.

AGENTS—Big Profits, Gold Sign letters easily applied, samples free. Liberal offer to General Agents. Dept. C, Interstate Sign, 2620 No. Halsted St., Chicago.

EARN Big Money Fast applying Lithogram Initials to automobile doors. Every owner buys. $1.35 Profit on each sale. Full particulars mailed. Address, Lithogram Company, 17-S East Orange, N. J.

YOU can make $12,000 a year selling well-known, standard, advertised make of hand-drawn chemical fire engines, motor fire apparatus, extinguishers, hose, and complete line of fire-fighting sundries. We have several openings in good territories. Other men are making $1,000 a month in territories not so good as we now offer. Address Ajax Fire Engine Works, Bush Terminal Bldg., 10, Brooklyn, N. Y.

AGENTS Make $10 a day selling Presurown Trouser presser and creaser. Connolly, 55 Vesey St., New York.

AGENTS wanted to sell "Havana Treat" 5c cigars to Smokers and Stores. Havana Treat Cigar Co., Utica, N. Y.

GOOD income, spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method; producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in big money-making business. Write for free samples, showing finishes, etc. Gunmetal Finish Co., Ave. B, Decatur, Ill.

GOLD Leaf Sign Letters; make and sell; profits exceed 1,000%; immense demand; particulars free. Johnston Co., Quincy, Ill.

AGENTS—Texe Remedies 200%. Address Int'l. Remedy Co., 1331 Franklin, St. Louis, Mo.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, O.

IF you need good live agents—fellows who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. J. Roy McClellan, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

AGENTS make 140% profit. Iradium (luminous) crucifix shines in the dark. Sells for $2.00. Costs 84c. Complete line religious articles, crucifixes, bulbs, switch plates, house numbers and match boxes. Novel! Ornamental! Useful! Every home a prospect. Big sales. Get free demonstrating outfit. The Pioneer Corporation, 1259 W. 63d St., Chicago, Ill.

AMERICO Booster auxiliary water carburetor makes autos burn water. Eliminates carbon. Low cost; liberal profits; details free. Americo Co., Dept. 178, Cincinnati, Ohio.

ANY man handy with paint brush can start new mechanical business on nearly nothing; needed everywhere; nearly all profit; experience not required. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

SELL Necessities. Everybody needs and buys the "Business Guide." Bryant cleared $800.00 in July. Send for sample. It's free. Nichols Co., Box 4-B, Naperville, Ill.

AGENTS make 500% profit handling Auto Monograms, New Pictures, Window Letters, Transfer Flags, Novelty Signs. Catalog Free. Write Hinton Co., Star City, Ind.

PORTRAIT Agents, who want good work and prompt service and who desire to purchase their frames at factory prices, should write us at once for catalog and price list. W. G. Hannan Co., Dept. A-5, 57 E. 18th St., Chicago, Ill.

AGENTS—New patented curtain rod, necessity in every home; big profit; 4 to 10 sales at every house. Write for free sample. Home Curtain Rod Co., Providence, R. I.

LARGE shirt manufacturer wants Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big values. Free samples. Madison Mills, 503 Broadway, New York.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marui Company, Tribune Bldg., New York, N. Y.

AGENTS: Big Money Monogramming By Transfer Method. Catalogue Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

$200 WEEKLY. Free samples. Sell gold sign letters to stores, offices. No experience. Big future guaranteed. Can travel. Exclusive territory. Become our general agent. Acme Letter Co., 2800D Congress, Chicago.

MAKE $25 to $50 Week representing Clows' Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clows Company, Desk 31, Philadelphia, Pa.

YOU can letter Automobiles, Doors, Trunks etc., without any previous experience by Transfer Process. Make $27.50 on $2.50 Outfit. Auto Monogram Supply Co., 16 Green St., Newark, N. J.

BEST Proposition on Earth. Kitchen Specialty Every Woman Wants. Nothing like it in existence. 200% profit. Best Novelty Mfg. Co., Dept. C, 160 N. Wells, Chicago.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., 201 Olive, St. Louis.

AGENTS and portrait men. Crew managers. We give you more for your money. Better and quicker service. Lowest prices on frames and glass. Rejects credited. Catalog free. The Pioneer Corporation, 1259-A West 63rd St., Chicago.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 25c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

YOU can be your own boss with our Key Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. Pease Die Works, Dept. M, Winchester, N. H.

PATENTS—Write for our free illustrated guide book and Evidence of Conception Blank. Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalog and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

DICHINOLINDIMETHYLSULPHATE. It's a Chemical. Millers The Chemist supplies Latest Manufacturers' Formulas for Food, Beverage, Household, Automobile, Summer Specialties in all lines. Grape-ola New Beverage with the Kick. Stamp brings Lists, Valuable Information to start a business paying Fifty to Five Hundred Dollars weekly with small investment. Miller, Chemist, Tampa, Florida.

WANTED—Tailoring Sales Agent—Make big money from very start—$60.00 to $75.00 weekly. Largest made-to-measure tailoring house, furnishing an equipment of five hundred woolens, wants you to take orders. Satisfaction guaranteed. Biggest merchants in many towns have started with our line. If you want to establish yourself permanently in business and make big money write for full particulars, giving your experience as salesman or tailor's sales agent. H. F. Foster, Sales Manager, Lock Box 483, Chicago.

AGENTS—Best seller: Jem Rubber Repair for tires and tubes; supersedes vulcanization at saving of over 800%; put it on cold, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 505.

AGENTS—If you are making less than $300 a month our proposition on Sentinel Burglar Alarms for windows and doors will interest you. Many agents earn $20 daily. Brand new inventions. No wires, batteries or nails. Instantly attached to any door or window. Handsomely nickel plated. Sell on sight. No competition. Provides cheap burglar insurance. Big money makers. Write today for extremely liberal terms to agents. Sentinel Alarm Co., 140 S. Dearborn St., Chicago, Ill.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stalbrite Co., 1115 Second Ave., New York.

MAKE $2 an Hour. Article that removes iron rust, grass, medicine, fruit, mildew stains. Cleans Panama and Straw Hats. Bleaches clothes. Sells Every home. Write for free demonstrating outfit and start taking orders at once. Christy, 81A Union, Newark, N. Y.

AGENTS: Big Returns, fast office sellers; particulars and samples free. One Dip Pen Co., 2 Daily Record, Baltimore, Md.

AGENTS make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

BIG money and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

OUR Ex-Cel Luminous Crucifix shines brilliantly in the dark. Churches, hospitals and individuals are only waiting for a demonstration before buying. Agents make handsome profits. W. G. Hanman Co., Dept. B, 57 E. 18th St., Chicago.

HIGH-GRADE SALESMEN WANTED

SALESMEN can earn $5.00 a day selling our line of Calendars, Fans, Pencils, Whistles, Yard Sticks, Blotters, Fly Swatters, Signs and other Novelties. Liberal commission. Sells entire year. Fine side lines. Local and traveling agencies. Live capable men can build up a big local trade or a big business in a wide territory. One of the finest lines on the road. Only one case to carry. High-grade salesmen can make $5,000 a year. Address Model Calendar Co., Dept. 226, South Bend, Ind.

ONLY one policy a day means $130 per month profit; same on renewals. Policy pays $5,000 death; $25 weekly benefit for injury or sickness. Premium $10 yearly. Full or spare time. Easy seller. Write quick for territory. Underwriters, Dept. K-30, Newark, N. J.

HAVING sold 150,000 of a household appliance in New England we now offer direct salesmen and district managers in other territory equal opportunity to earn from $2,500 to $5,000 yearly. The Reeves Company, 65 Broad Street, Milford, Conn.

TO a Few Salesmen—real producers—a live manufacturer offers a proposition of exceptional merit. Plenty of opportunity to develop and advance. Get your application in at once. Auburn Brush Co., Box 315, Lynn, Mass.

MAKE big money selling new, self-adjusting Robert Wrench. Most wonderful tool on market. Sells for $1.85. You make almost 100% on each. No free samples. Robert Wrench Co., 71-C Murray St., New York.

SALESMEN—Sell Zim's Peerless Collection System (108 letters). Professional and business men need it. Has special, exclusive features. Sell $7.50. Costs you $2.00. Creditors' Association, 312 McKnight Bldg., Minneapolis, Minn.

SIX Live Patented auto accessories: Oil gauge, windshield cleaners, hose clamp, etc. No investment. Big commissions. Address Sales Mgr., 42, Sta. C, Omaha, Nebr.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission, 2421-SP, Smith, Detroit.

SALESMEN sell "Ratskyll," our non-poisonous Rat and Mouse Exterminator. Wonderful new discovery. Ready for use, no mixing, no bait required. Harmless to man, poultry, cat, dog and other animals. Rodents die outside premises. No odor. Call on hotels, restaurants, bakeries, groceries, department stores, mills, etc. Good salary and commission. Empire Specialties Co., 1549 N. Wells, Dept. 301, Chicago, Ill.

SALES district managers wanted for Dominant Polish, the new wonder that is being adopted everywhere. If you have small capital we can make you a remarkable offer, one that will put dollars in your pockets while you are making cents now. Exclusive territory granted. Dominant Products Co., 163 South St., New York City, N. Y.

SALESMEN—$200 to $500 monthly easily earned demonstrating wonderful Two-pound Desk Adding Machine. Sells for only $15. Equals work of costly machines, speedy, accurate, fully guaranteed, big demand, stores, offices, garages; enormous profits. Experience unnecessary, it sells itself. Write quick for trial offer. Address, Pangborn Adding Machine Co., Desk 600, Grand Rapids, Mich.

SALESMEN to sell new invention of popular-priced combination fire and burglar alarm; can be handled as side line by cigar, hardware, drug, candy salesmen and others; big profits, wonderful opportunity for good workers, territories limited, nationally advertised. Send 25c for sample and particulars at once. Frank's Products, 702 Broadway, New York City.

MAKE $50 Daily. Something New. 400% Profit. All business, professional men need it. Sells $5. Costs $1. Brooks, Texas, sold 20 first day, profit $80. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample outfit free. Federal Association, 71-D Asylum St., Hartford, Conn.

EASY to sell Groceries, Paints, Automobile Oils, Roofing, Stock Food to consumers from samples, no capital or experience necessary; steady, profitable work. Commissions advanced. Satisfaction guaranteed. 50 years in business. Write for full particulars. Loverin & Browne Co., Wholesale Grocers, 1775 S. State Street, Chicago, Ill.

A FIRST-CLASS Side-line Salesman can obtain a most desirable arrangement. We are established manufacturers selling a specialty to banks. Samples light and compact. Address, Continental Banking-Supply Co., Mexico, Mo.

SALESMEN—Find out about "Smack," the new soft drink flavor. No competition. There's nothing else like it. Exclusive territory. Big profits. Write today. Pitkin & Co., 399 Commercial Bldg., Newark, New York.

SALESMEN—If you want $6,000 this year, write me. Strong line for retail stores. Nationally advertised. Liberal weekly advance to producers. W. Morgan, Mgr., 1920 Euclid, Cleveland, Ohio, Dept. 200.

CREW Managers, Distributors: Fast-selling $4.69 household necessity. No capital required. Protected territory. We deliver and collect. Attractive sales plan. Address, Eastern Keenware Co., Franklinville, N. Y.

SELL patented necktie holder. 25 cents; five for one dollar. Gross: six dollars. Standard Metal Stamping Works, 224 Centre, New York.

SOMETHING New, a Necessity. All business and professional men need it. Sells $7.50, costs you $1.40. Big repeater. Sample free. Merchants Ass'n., Minneapolis, Minn.

LET'S Go! We produce, you sell "Lyns-Lens" shade everywhere electric lights are used. Unusual moneymaker. Write, Lynds, Wilburton, Okla.

SALESMEN, Sell B. & C. Pedal for Fords. Write for particulars. Burnham-Cote Co., Holyoke, Mass.

MAKE $50 to $100 per week selling direct to wearer our $20, $24, $28 line of Virgin wool made-to-measure Suits and Top Coats. You get your profit the minute sale is closed; experience not necessary. We teach you how and furnish everything to do business with; no extra charges for double breasted or fancy coats, extra sizes or skeleton linings. House of Campbell, Campbell Building, 456 South State St., Chicago, Ill.

SALESMEN: Sell State pocket maps, showing auto roads, to advertisers and dealers. Easy to sell. Get our splendid offer. Standard Map Company, 127 W. Ohio St., Chicago.

BEST Seller: Jem Rubber Repair for tires and tubes; supersedes vulcanization at saving of over 800%; put it on cold, vulcanizes itself in two minutes, guaranteed to last life of tire or tube; sells to every auto owner and accessory dealer. Get particulars how to make big money and free sample. Amazon Rubber Co., Philadelphia, Pa., Dept. 510.

ASKO—Salesmen to sell Auto Acc. as side line; can carry sample in vest pocket; sells on sight. Big comm. Write for sample. Allen Specialty Co., 2721 West Lake St., Chicago.

"OUTOSITE," aluminum hip suspenders, 50c. Shirt down, pants up. Enormous seller. Woods, 501 North Seventh, St. Louis.

SELL Advertising Pencils. Big Commissions. Quick Sellers. Write for Proposition. Keystone Pencil Works, Altoona, Pa.

57 MILES per gallon made with new patented gasoline Vaporizer. Write for particulars. Vaporizer Co., Pukwana, S. Dak.

EVERYBODY Eats Every Day. You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee, and entire line of groceries, as well as Paints, Roofing, Aluminum Ware and Automobile Oils, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hitchcock-Hill Co., Dept. 200, Chicago, Ill. Reference: Any Bank or Express Co.

$300 PER month and bonus guaranteed salesmen successfully demonstrating wonderful new adding machine. Retails $15.00. Work equals $350 machine. Genuine opportunity. Full time or side-line. Lightning Calculator Co., Dept. G, Grand Rapids, Mich.

AGENTS—$60-$200 a week. Free samples. Gold sign letters anyone can put on store windows. Liberal offer to general agents. Metallic Letter Co., 431-E N. Clark St., Chicago.

LIVE Wire Distributors and Dealers everywhere make money selling Seal-Fast inner-tube repair kits because of the unequalled efficiency and our aggressive and helpful sales promotion and advertising co-operation. Write Sales Manager for particulars. Robert M. Bowes Co., Indianapolis, Ind.

HELP WANTED

$5-$10 HOURLY during spare or full time laying Stamco Marbleized Flooring. No experience necessary. Indestructible, noiseless, waterproof. Most substantial and ornamental interior flooring for homes, public buildings, etc. All colors, easily prepared and applied. One job brings many. Enormous profit. Field unlimited. Formula, complete instructions and sure selling plan, $3. Stamco Products, 2412-F, Ogden Ave., Chicago.

WHAT is it worth to you? Distributor—District Manager—Salesmen or Agent—to have the agency for best line of Rubber Specialties on the market? Hot Water Bottles, Bathing Caps, Combination Shopping Bags, Pure Rubber and Rubberized Aprons, Rubber Gloves, and forty other fast-selling articles needed in every home. Profits range from 100 to 150 per cent. Write B. & G. Rubber Mfg. Co., 618 Penn Ave., Pittsburgh, Pa., Dept. 156.

GOVERNMENT positions. Men, women, 18, over. Wanted for railway mail, post-office, other government positions. Examination soon. Salary $1400-$1800 year. Experience not required. Particulars free. Write Columbia School of Civil Service, 411 Pope Bldg., Washington, D. C.

$100 MADE in one week by young man in small town without capital or expense in local advertising business. Why can't you do likewise? Free book tells how. S. Myer, 211 7th St., Louisville, Ky.

DISTRIBUTOR or sales agency to represent line of sanitary brushes sold direct to home. Oldest concern, excellent proposition with exclusive territory. Large commissions. Wire Grip, 29 Mercer St., New York, N. Y.

WOMEN wanted: Become costume designers. $140 month. Learn while earning. Sample lesson free. Franklin Institute, Dept. D-595, Rochester, N. Y.

$35 WEEK. Learn while earning. Boys—men. Become automobile experts. Write Franklin Institute, Dept. D-401, Rochester, N. Y.

FIREMEN, brakemen, baggagemen, sleeping car, train porters (colored). $140-$200. Experience unnecessary. 810 Railway Bureau, East St. Louis, Ill.

START Silvering Mirrors, Auto Headlights, Tableware, etc. Plans free. Clarence Sprinkle, Dept. 28, Marion, Ind.

LEARN Plating—Automobile Painting—Refinishing. Plans Free. Norman Rorick, 427 Carroll St., Akron, Ohio.

MEN—Boys over 17. Become U. S. Government Railway Mail Clerks. Big opportunity. Commence $135 month. Quick, sure raise to $195. Pleasant work traveling constantly. Every second week off—with pay. No layoffs. Common education sufficient. Pull unnecessary. Write immediately for free list Government positions open. Franklin Institute, Dept. E-3, Rochester, N. Y.

EARN Money at Home; We Pay You $15 to $50 weekly during spare time. No experience necessary writing show cards. We instruct by correspondence, and keep you in steady work. Sho-Rite Sign System, Dept. 270, 5439 Field Ave., Detroit, Mich.

STRICTLY Homework. We buy your product. Materials obtainable anywhere; no canvassing nor experience; 255 propositions, plans, samples, formulas, 25c; details dime; money back. Co-operative Club, Augusta, Maine.

WANTED—Men to learn motion picture machine operating. Positions secured. Salary $50 weekly; small tuition in easy payments. Write today. Box 38, Sioux Falls, South Dakota.

EARN $10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads. Outfits furnished. E. Decie Laboratories, 286 Fifth Avenue, New York, N. Y.

MEN—Boys. Become Railway Mail Clerks. $135 month. Write immediately. Franklin Institute, Dept. E-21, Rochester, New York.

START Little Mail Order Business anywhere. Home employment evenings. Everything furnished. Stamp brings Instructive Booklet. H. Pier, 72 Cortlandt Street, New York, N. Y.

GOVERNMENT needs Railway Mail Clerks, $133 to $192 month. Write for free specimen questions. Columbus Institute, E2, Columbus, Ohio.

WANTED—Men—Boys over 17. Become Railway Mail Clerks. Commence $133 month. Common education sufficient. List positions free. Write immediately. Franklin Institute, Dept. E-21, Rochester, N. Y.

GOOD prices paid for butterflies, insects. See Sinclair's Display Advertisement, page 27.

$135 MONTH. Become Railway Mail Clerks. Big opportunity. List positions free. Write immediately. Franklin Institute, Dept. E-21, Rochester, N. Y.

MANY Ways to Make Money, 25c. W. D. Browning, Memphis, Tenn.

"WHAT to Invent for Profit" free. Patent News-B, Washington, D. C.

U. S. GOVERNMENT Jobs. Men—Women. $92 to $150 month. List positions open free. Write immediately. Franklin Institute, Dept. E21, Rochester, N. Y.

SALESMEN—Become Independent. Own your business; experience unnecessary; selling our $7,500 Accidental Death, $50 Accident, $25 Sick Weekly Benefits; $12.50 yearly; other amounts proportionate. Guaranteed steady income from renewals. $250,000 deposited Insurance Department. Registration Dept. A, Newark, N. J.

SIGN Letter Agents and Painters: 500% Profit. Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free Samples. Metallic Letter Co., 431D N. Clark St., Chicago.

FINGER Print Lesson based on Henry System included with Detective Course. Particulars free. Write, American System, 1968 Broadway, New York.

WANTED—Men, women over 18 for United States Government positions. Good pay; lifetime jobs. Experience unnecessary. Write for full information. Chicago Civil Service College, Dept. A, Kesner Building, Chicago.

ALL men—women over 17, willing to accept Government Positions $135 (Traveling or Stationary), write Mr. Ozment, 101 St. Louis, Mo.

SILVERING mirrors, French plate taught. Easy to learn, immense profits. Plans free. Wear Mirror Works, Excelsior Springs, Mo.

UNITED States Government Wants Men. Excellent positions at attractive salaries. Railway Mail Clerk Examination soon. Let our expert (former United States Civil Service Examiner) prepare you for this and other fine positions. Write today for free catalog PM. Patterson Civil Service School, Rochester, N. Y.

BE a Railway Traffic Inspector! $110 to $250 monthly; expenses paid after 3 months' spare-time study. Splendid opportunities. Position guaranteed or money refunded. Write for free booklet CM-46. Stand. Business Training Inst., Buffalo, N. Y.

STORIES, poems, plays, etc., are wanted for publication. Good ideas bring big money. Submit manuscripts or write Literary Bureau, 522, Hannibal, Mo.

START a Paying Business of Your Own. Be a business man. Any location. 8,000 new Tire Vulcanizing and Repair Stations needed. Business always good. Are you ambitious? $100 will start you. Write at once. Wonderful opportunity. Equipment Co., 175 Canal, Cincinnati, Ohio.

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MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers' League, 236 Wainwright, St. Louis.

INVENTORS desiring to secure patents should write for our book, "How to Get Your Patent," tells our terms and methods. Send sketch for our opinion of its patentable nature. Randolph & Co., Patent Attorneys, 620 F, Washington, D. C.

OUR genuine gold window sign letters are an excellent money-making proposition for handy men. Slann Sign System, St. Antoine St., Detroit, Mich.

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FIFTY genuine photo postals from any photo or product, $2.00; 500, $12.00; Samples, 10c. Address Barbeau, Oswego, N. Y.

25 WORDS in 50 weekly and Sunday newspapers $5. Cope Agency, 233, Champaign, Ill.

INCH display 100 magazines, $4.00; three times, $8.00. Pennell Company, Covington, Ky.

ADVERTISE your ad in 100 magazines for 5c per word. Sample copy 10c. Harley Snell, 1021 State Ave., Cincinnati, Ohio.

YOUR 30-word advertisement in 75 magazines $1.50. Riley Publishers, 1333 S. 50th Court, Cicero, Ill.

JACOBUS Copy Pulls Business. Jacobus Advertising Service, Irvington, N. J.

COMMERCIAL Engraving and Printing, the most practical and complete book on engraving, printing and allied subjects ever published. Over 800 pages and 1500 illustrations presenting over 3500 distinct ideas on 35 separate subjects. Cloth, price $15.00 prepaid. We highly recommend this book. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

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100 AGENTS' names $2.00. Send for list of classifications. Pennell Company, Covington, Ky.

EVERY county, 2,075 Nebraska farmers, $3.00. Jeston's Service, Box 769, Omaha, Neb.

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TYPEWRITERS, All Makes. Save one-half. Thoroughly Rebuilt in our factory by the famous "Young Process." Fully guaranteed. Free trial. We handle all standard makes. Cash or sold on easy terms. Write for Catalog. Young Typewriter Co., Dept. 320, Chicago, Ill.

UNDERWOOD Typewriters at far less than manufacturer's price; rebuilt, all worn parts replaced, guaranteed good as new. Cash, installment payments. Write for Catalogue A-151. Typewriter Emporium, estab. 1892, Montrose and Ravenswood Ave., Chicago, Ill.

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TYPEWRITERS, all makes, $15.00 up. Guarantee five years. One month's free trial. Special proposition to agents. Typewriter Manufacture Exchange, Fordham, New York.

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RELIABLE information furnished on any subject or money refunded, 75c. Co-Operative Service, Times Plaza, Box J64, Brooklyn, N. Y.

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SOUTH Carolina, Rock Hill, Collections, Legal Business. J. H. Foster.

INCORPORATE. Our lawyers do the work, saving you time, annoyance and money in incorporating under the most liberal laws of Arizona. Laws and forms free. Southwestern Securities & Investment Co., Box D488, Phoenix, Ariz.

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YOU can make 50 to 100 copies of a letter, notice, etc., on three cents' worth of Heyer Quality Compound. Write for free catalog and samples. The Heyer Duplicator Co., 162 N. Wells St., Chicago.

WANT a "Modern" Duplicator to print Typewritten or Pen Written Letters, Drawings, Lessons, Music, Bids, Menus, Maps, Specifications or anything in one or more colors? Prints two a minute, $2.25 up. Special sale on; 30 Days Free Trial. Booklet Free. J. E. Durkin-Reeves Co., Pittsburgh, Pa.

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NEW $3.50 Automatic Adding Machine. Adds, Substracts, Multiplies. Absolutely accurate. Capacity $999,999.99 Fully guaranteed. 75,000 pleased users. Makes adding easy, positive, quick. Eliminates Mistakes. Saves Time. Postpaid, $3.50. Bassett Co., 1458-C, Hollywood Ave., Chicago.

FREE Trial. Marvelous new Adding Machine. Adds, Subtracts, Multiplies, Divides, automatically. Work equals $350.00 machine. Price only $15.00. Speedy, durable, handsome. Five-year guarantee. Used by largest corporations. Write today for catalog and free trial offer. Lightning Calculator Co., Dept. E, Grand Rapids, Mich.

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250 GOOD Bond Letterheads or Envelopes printed and mailed $1.50, or 1,000 for $4.50. Address Hatton Printing Co., Hatton, N. Dak.

150 NOTEHEADS, 100 white Envelopes printed and mailed $1.00. Samples printing free. "Sun Co.," Mohawk, New York.

500 LETTERHEADS and 500 Envelopes $4.65, 20 lb. bond paper. Samples. Wellman Printing Co., Huntington, West Va.

1,000 HAMMERMILL Letterheads or Envelopes $4.00. Full Line Samples Free. Quality Printshop, Marietta, Ohio.

1000 FULL-SIZE Hammermill Bond Letterheads $3.65. Postpaid. Other stationery in proportion. Business building Multigraph letters cheap. Samples free. Charles B. Hatfield, Box 353, Owego, N. Y.

5000 5½x8½ CIRCULARS, $8.50; 5½x6¾, $6.50; 3⅝x5½, $4.50. Attractive colored paper. Samples. Bargain List. Good's Printery, Harrisonburg, Va.

PERFECT Printing. Everything reasonable. 1000 bond letterheads $4.75. Samples free. Address, Lewis Stationery Co., Troy, New York.

200 HAMMERMILL Bond Letterheads, Envelopes, Billheads or Business Cards, $1.00 postpaid. Race Printing Company, Hudson, N. Y.

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GET our samples before ordering elsewhere. "Adverpress," Station C, Milwaukee.

MERCHANTS: Lowest prices on Highest Quality Advertising Pencils. Sample with your Ad. on imprinted in Gold, 10 cents. S. Musial & Co., 422 Walnut St., Yonkers, N. Y.

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WE print anything. Circulars, stationery, Catalogs. Samples. Commercial Press, Batavia, Ohio.

100 BOND Letterheads, 100 Envelopes $1.35. Others reasonable. Economic Press, Leonia, N. J.

REDUCED prices for better printing. 1,000 Bond letter-heads, $5.00; 1,000 good envelopes, $4.25; 1,000 four-page folders, 3½x6¼ inches, $12.00. Catalogues, circulars, booklets our specialty. All printing at reduced prices. Samples free. Fantus, 525 S. Dearborn St., Chicago.

QUANTITY Users save 30%. Wolf Roll Labels, Sta. E, Philadelphia.

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EMBOSSED business, personal stationery. Samples, stamp. Daniels Co., Pittston, Pa.

1,000 LETTERHEADS or Envelopes, $3.00, sent prepaid. Samples Free. Monitor Press, Morrisville, Pa.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalogue. Model Press, York, Penna.

RAZORS AND BLADES

BLADES resharpened; one edge, 2c; double, 3c. Ervin Mikkelson, Wakonda, S. D.

BLADES Resharpened 2c single edge, 3c double. Guaranteed service. Standard Safety Razor Corporation, Pittsburgh, Pa.

BLADES, resharpened, one edge 2c; double 3c. New York Edge Co., Glen Cove, N. Y.

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WHY Men Are Old at Forty. Men, if depressed, if backache, sciatica or tender feet annoy you, if nerves are gone, if your sleep is disturbed, send for a simple drugless treatment that cannot interfere with your work or doctor's care. If you are suffering you will bless this book. Write now before you forget. The Electro Thermal Co., 2128 Main St., Steubenville, Ohio.

I WANT to send Free to every chronic pipe smoker in the country a good, big, generous sample package of my pure, suncured, nature-flavored Old Green River Pipe Tobacco. No money to pay. If you are a tobacco crank, all the better. Try the pure stuff. No syrup, flavoring or dope. After you try it free, I'll show you how to cut your smoke bill one-half and get more pipe joy. Just send name and address, and say whether you want mild, medium or strong. Pete Moberly, Box 820, Owensboro, Ky.

TOBACCO

HOMESPUN Smoking Tobacco, mild and mellow—10 lbs. $1.50; 20 lbs. $2.75; delivery guaranteed. We furnish free recipe for preparing. Smoking Tobacco Exchange, Sedalia, Ky.

PURE Red Leaf Tobacco, quality guaranteed. Best chewing, 4 lbs. $1.25, 10 lbs. $3.10. Mild smoking, 4 lbs. $1.00, 10 lbs. $2.10, delivered. O. D. Collier, Agent, Martin, Tenn. "Collier is absolutely honest and reliable." Martin Bank, Raymer, Cashier.

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BASEBALL Players, use Hollman's Glove Pep. It's great. Softens the leather, makes the ball stick, breaks in new gloves quickly; 2 sizes, 50c and $1. Send Paul Hollman Company, 6029 St. Lawrence Ave., Chicago, Ill.

GUNS and Pistols of any make repaired. Bradley & Son, Savannah, Ga.

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FISHERMEN, Attention! Don't dig for worms. Wormite brings them out. Something new. No trouble. Sample ten cents in coin. Address, United Supply Bureau, Elizabeth, N. J.

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16'-ROWBOAT, 12½'-Rowboat, 12'-Folding Rowboat. Easily made. Construction blueprints 30c each. Wee-Sho-U Co., West Market, Detroit, Mich.

PALMER four-cycle motor for Rowboats, Yacht Tenders. Price $98.00. Also two and four-cycle to seventy-five horsepower. Catalogue free. Palmer Bros., Cos Cob, Conn.

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BUILD a genuine Choraleon phonograph and save over half. Big profit building and selling. We furnish motors, tone-arms, full instructions and all necessary parts. Send for catalog and free blueprint offer. Choraleon Phonograph Co., 622 11th St., Elkhart, Ind.

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SUPERIOR Phonograph parts make real musical Instruments. Prices low. Superior Phonoparts Co., Erie, Pa.

WONDERFUL Bargains in Phonograph Cabinets. Hunter Factory, McHenry, Ill.

BUILD your phonograph. Quality Phonoparts. Highest quality spring and electric Motors, Tone Arms, Reproducers, Amplifiers, Case Material and Accessories. Free Blue Prints and Building Instructions. Big saving. Wonderful results. New catalog mailed for ten cents. Hoosier Manufacturing & Supply Co., Phonograph Supply Department, 313 Baldwin Block, Indianapolis, Ind.

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RAG Jazz Piano, Saxophone, or Tenor Banjo in 20 lessons. Christensen Schools in most cities, or Learn by Mail. Write for Booklet, or money-making teacher's opportunity. Axel Christensen, 16 E. Jackson, Chicago, Ill.

WE Buy, Sell and Exchange 65-note player rolls. Standard Music Co., 183 North Wabash Ave., Chicago, Ill.

MUSIC—Composed, arranged, orchestrated. Best service at "knockout" prices. Paul Jeffries, Michigan, Arctic, Atlantic City, N. J.

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WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

I WANT song poems. Casper Nathan, Garrick Theatre Building, Chicago.

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INVENTORS! Send sketch or model of your invention for opinion concerning patentable nature and exact cost of applying for patent. Book, "How to Obtain a Patent," sent free. Gives information on patent procedure and tells what every inventor should know. Established twenty-eight years. Chandlee & Chandlee, 426 Seventh St., Washington, D. C.

PATENTS—Herbert Jenner, patent attorney and mechanical expert, 622 F St., Washington, D. C. I report if a patent can be had and its exact cost. Send for circular.

PATENTS—Trademark, copyright; folder free; results procured. Write Metzger, Washington D. C.

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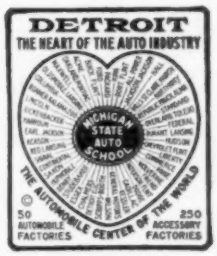

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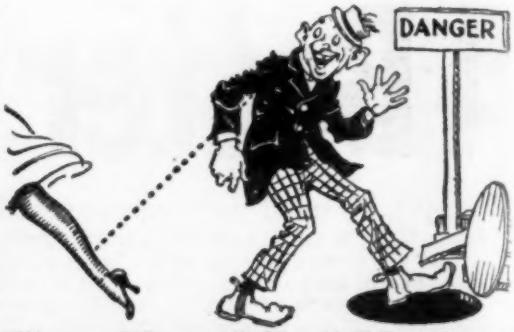

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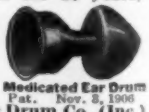

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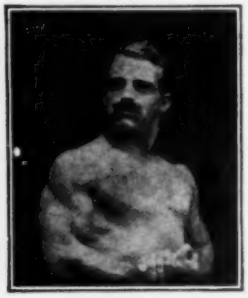

That is my business. I make no other claims. But what I promise, I fulfill. I will increase your arm one full inch in 30 days and your chest in proportion. In three months I will make you a finished strong man. Are you interested? Read my book "Physical Perfection." It tells you how. All I ask is 10 cents to cover postage and wrapping. Don't put it off. Send today.

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Your skin can be quickly cleared of Pimples, Blackheads, Acne Eruptions on the face or body, Enlarged Pores, Oily or Shiny Skin. **$1,000.00 Cold Cash says I can clear your skin of the above blemishes.** WRITE TODAY for my FREE Booklet—*"A Clear-Tone Skin"*—telling how I cured myself after being afflicted for fifteen years.

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FREE TRIAL

Inner surface is made adhesive to secure the PLAPAO-PAD firmly to the body, keeping the PLAPAO continually applied and the pad from slipping. No straps, buckles or springs attached. Soft as velvet—easy to apply.

It's the Non-Slipping, yet Non-Rigid Pad and What is Within It That Counts

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To the extent of 5,000 sufferers who may apply I will send, ABSOLUTELY FREE, a sufficient quantity of the Plapao to positively convince them that this is the only logical, common-sense way of treating rupture. Plapao is a highly astringent medication placed within the Plapao-Pad and being absorbed through the skin, creates a wonderful feeling of relief and at the same time tends to strengthen the weakened muscles and thus permanently close the rupture opening. The process of recovery is natural, so you'll have no use for a truss—you can throw it away forever! Old and young have testified under oath that the Plapao-Pads cured their rupture—many of them long-standing, aggravated cases—without delay from work. Patent allowed in U. S. and foreign countries. Awarded Gold Medal at Rome and Grand Prix at Paris.

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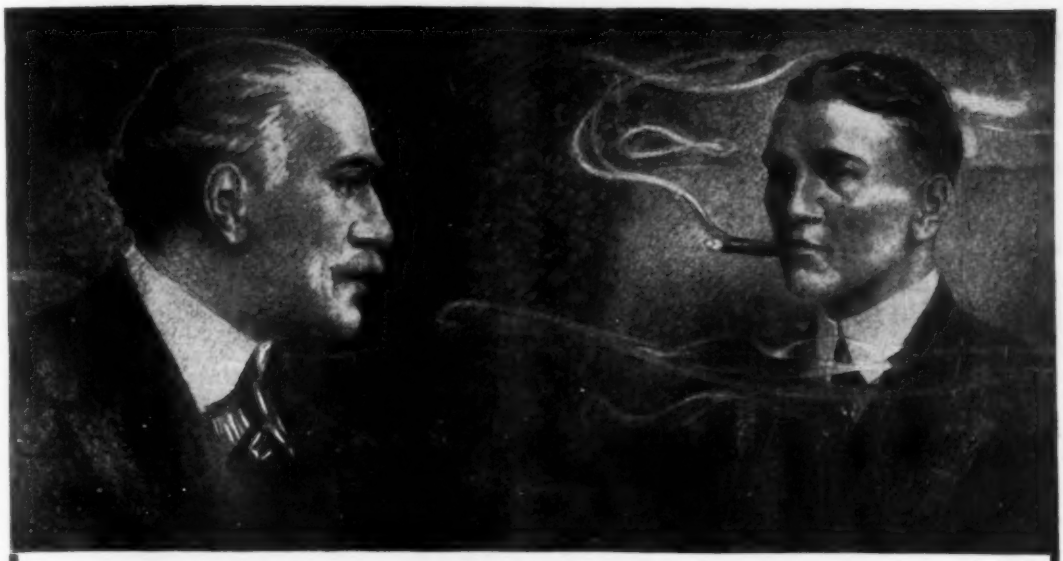

Tobacco Is Hurting You

Look at the facts square in the face, Mr. Tobacco User. You may think tobacco is not hurting you.

That is because you haven't as yet, perhaps, felt the effects of the nicotine poison in YOUR system. For **you** know that nicotine, as absorbed into the system through smoking and chewing tobacco, is a slow working poison. Slow, yes—but **sure.**

Tobacco is lowering your efficiency. It slows a man down. Makes it harder for you to concentrate your mind on your work. You haven't near the amount of "pep" and energy you would have if you stopped using it. There's many a man twice as old as you in years who's twice as young in energy, simply because he lets tobacco alone.

Some day you will realize to what an alarming extent tobacco **has** undermined your system.

When your hands begin to tremble—
and your appetite begins to fail—
and your heart seems to "skip a beat" now and then—
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then you have a right to suspect that
TOBACCO is getting the upper hand.

Any well-informed doctor will tell you that these are only a few of many symptoms of tobacco poisoning.

And **YOU** know that the use of tobacco in **any** form is an **expensive, utterly useless** habit. You know you **ought** to quit.

Tobacco Habit Banished

Let Us Help You

It dosen't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it—whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—**Tobacco Redeemer** will positively remove all craving for tobacco in any form in a very few days. Not the slightest shock to the nervous system. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is marvelously quick, scientific and thoroughly reliable.

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SEND Coupon for Free Proof Let us send you our **free** booklet on the deadly effects of tobacco, together with testimonial letters from men all over the country telling how they have been absolutely freed from the tobacco habit by this simple home treatment. You could not ask for stronger proof that **Tobacco Redeemer** will free you from the habit than the evidence we will gladly send on request. Just mail the coupon—or a postal will do.

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NEWELL PHARMACAL CO.
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- ☐ Toolmaker
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN or ENG'R
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ ARCHITECT
- ☐ Contractor and Builder
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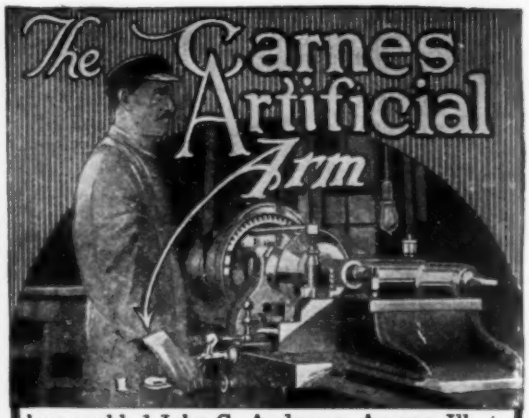

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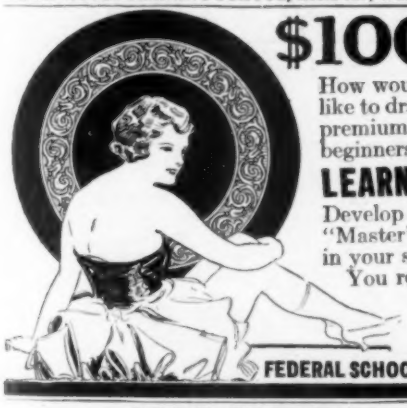

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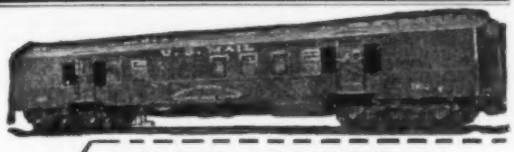

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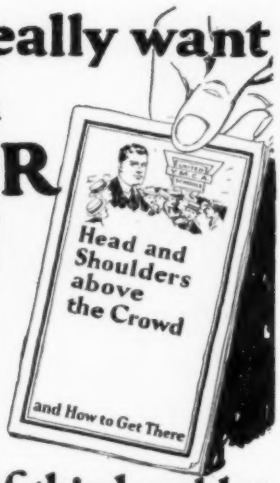

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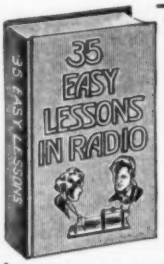

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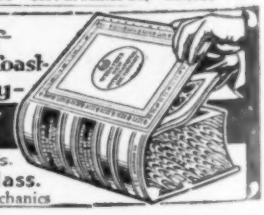

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The theory of radio transmission and reception will be touched on very briefly, as the purpose of the book is to describe, step by step, the actual construction of the apparatus and all auxiliaries.

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is the book that tells the how and why of radio telephony. Written so you can understand it fully. The biggest help to the amateur operator. 200 pages, freely illustrated.

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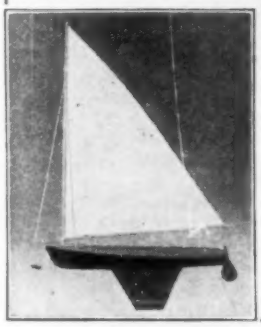

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"Everything but the paint"

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DO YOUR OWN ELECTRICAL WORK AND WORK FOR OTHERS IN YOUR SPARE TIME

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The most laughable novelty yet produced. Made of rubber, and you have only to blow it up and stand the pig on his feet, when he begins to squeal as he slowly collapses and finally lies down and dies in the most natural manner. You can blow him up as often as desired, and each time he will go through the same performance to the great amusement and delight of your friends.

Price **15** cents; **3** for **40** cents; one dozen **$1.35**, mailed postpaid.

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Very pretty little curiosities and decidedly novel. Fitted with Magnifying Lenses that enlarge the pictures to a very surprising degree; in fact, it seems almost incredible that a clear picture could be possible in such a small compass, and how sharp and distinct they show up when you look through. Come in assorted views—Actresses, views of Panama Canal, Lord's Prayer in type, etc.

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- ☐ Marine Engineer
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Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada.

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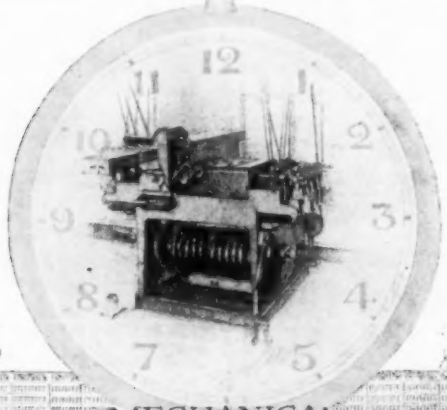

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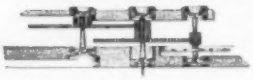

Jewel Bearings

FROM the application of the first wheel to mechanics, the elimination of friction, through the development of bearings, was one of the greatest problems confronting man.

Years ago watchmakers discovered that diamonds, rubies and sapphires being the hardest known materials were the best from which to make the bearings for the revolving parts of a watch.

For nearly three-quarters of a century Waltham has been inventing and perfecting machines for building and locating these most important parts.

The machine illustrated is the perfected result of the study and development related to this very important factor.

Nowhere else in the world can you find such a machine. Created and built at the Waltham factory, it performs a task day after day undreamed of, except by Waltham genius. This machine locates one bearing (or jewel) with the other so accurately that friction, the greatest enemy of good time-keeping, becomes a minor consideration in Waltham Watch construction.

When you own a Waltham Watch, the mechanical perfection of its parts insures you accurate time and the lowest possible up-keep cost of any watch made today.

This is one more reason why the Waltham Watch leads everywhere in true watch value. Buy a Waltham Watch and enjoy the pride you will have in its exclusive qualities of service and dependability.

Write for a valuable booklet that is a liberal "watch" education. Sent free upon request. The Waltham Watch Company, Waltham, Mass.

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Makers of the famous Waltham air-friction quality Speedometers and Automobile Time-pieces used on the world's leading cars

WALTHAM

THE WORLD'S WATCH OVER TIME

Where you see this sign they sell Waltham Watches

GIFTS THAT LAST

BUILT FOR HARD WORK

The Pace Maker must be made of sturdy stuff. By its ability for work, EVERSHARP holds its leadership. Day after day, its lead is driven to constant sharpness, writing thousands of words, smoothly and steadily. A minute for reloading and the work goes on.

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Put EVERSHARP on your working force. With no wasteful whittling, no loss of time, it is a positive economy. Styles for pocket, chain or woman's purse, in gold, silver and enamel, 65c to $65.

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HANDY ERASER UNDER THE CAP — NEW ERASER FREE WITH EVERY BOX OF EVERSHARP LEADS

SCIENTIFICALLY BALANCED — FOR SMOOTH AND TIRELESS WRITING

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The telephone at your elbow seems so simple an instrument, it does its work so quietly and quickly, that it is difficult to realize the vast and complex equipment, the delicate and manifold adjustments, the ceaseless human care "behind the scenes" in the central offices.

Behind the scenes is the terminal of all the underground and overhead lines on the streets and highways. Here are the cable vaults; the great steel frames containing the thousands of separate wires and fuses for the subscribers' lines; the dynamos and storage batteries; the giant switchboards through which your telephone is connected with the other thirteen million telephones in the Bell System.

And here, in charge of this equipment, are the guardians of the circuits —the wire chief and his assistants— master electricians and experts in telephony. Their first duty is the *prevention* of "trouble." By day and by night they are constantly testing the central office equipment, the overhead and underground lines, the subscribers' individual wires. And when, from some cause beyond control, "trouble" does occur, nine times out of ten it is repaired before the telephone subscriber suffers the slightest inconvenience.

It is the skill of the men behind the scenes, together with scientific development and construction, efficient maintenance and operation, which make it possible for you to rely upon the telephone day and night.

"BELL SYSTEM"

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

AND ASSOCIATED COMPANIES

One Policy, One System, Universal Service, and all directed toward Better Service

"Topkis taught me value"

I'D like to have the money I've wasted because I was afraid to buy an athletic union suit priced as low as a dollar. I cheerfully gave up double, year after year.

"I didn't know Topkis then.

"Finally, a salesman in Johnson's shop argued me into trying Topkis. He landed me as a life-time customer.

"My dollar never before brought me as much quality and value. Loose, airy fit that lets my skin breathe. No skimpiness; no bagginess; no pinch; no pull.

"Wear? That's where Topkis shines. Keeps its size, too."

Topkis Athletic Union Suits are made of best nainsook and other high-grade fabrics. Pre-shrunk—full size guaranteed. Be sure you get your correct size—38 if you wear a 38 coat, and so on.

No good dealer will ask more than a dollar for the Topkis Men's Union Suit—although many will tell you it's worth more.

Men's Union Suits, $1.00.

Men's Shirts and Drawers, 75c per garment. 75c for Boys' Union Suits, Girls' Bloomer Union Suits, and Children's Waist Union Suits.

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Ask for TOPKIS Underwear. Look for the Topkis label.

Write for free illustrated booklet and learn what's what about underwear.

TOPKIS

Athletic Underwear

IVER JOHNSON BICYCLES

Keep Fit

After a few weeks of bicycle riding you'll eat better, sleep better, feel better, and work better.

An Iver Johnson Bicycle so combines natural exercise with pleasure as to make the exercise enjoyable rather than tiresome.

The truss-bridge frame, seamless tubing of nickel steel, drop-forged parts, two-piece crank set—these are some of the features that guarantee the strength, speed and durability of every Iver Johnson Bicycle. The oldest firm in America making bicycles continuously.

Write at once for free bicycle catalog "B 4." Firearms catalog "A 4" also sent on request.

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Ask your dealer to show you an Iver Johnson Champion single barrel shotgun. Accurate, dependable, moderately priced.

Keep an Iver Johnson revolver in the home for self-protection. It's accident-proof—you can "Hammer the Hammer." Quick, accurate, safe.

Champions

For Every Engine Everywhere

Cost You Less —

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Your Dealer has Champions and can tell you why . . . . . You should buy a full set. .

CHAMPION SPARK PLUG CO. Toledo . Ohio.

No Money Down!

Our determination to this year double our sales of the world famous Santa Fe Special and Bunn Special Watches prompts this matchless offer.

Santa Fe Special

NEWEST DESIGNS 21 Jewel MONTGOMERY DIAL

Look

Adjusted to Positions
Adjusted to Temperature
Adjusted to Isochronism
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Thin Model All Sizes

While other watch dealers are raising their prices, asking you for larger monthly payments, and making payment terms harder for you to meet, we are offering you our new model Santa Fe Special, no advance in price, no money down, easier terms and smaller monthly payments. WE realize the war is over and in order to double our business we MUST give you pre-war inducements, better prices, easier terms and smaller payments.

Without one penny of advance payment let us place in your hands to see, to examine, to inspect, to admire, to approve, a real masterpiece in watch creation.

A watch which passes the most rigid inspection and measures up to the exacting requirements of the great Santa Fe Railway System, and other great American Trunk lines.

Page twelve of our Watch Book is of Special Interest to you

Ask for our Watch Book Free—then select the Watch you would like to see, either the famous Santa Fe Special or the 6-position Bunn Special, and let us explain our easy payment plan and send the watch express prepaid for you to examine. No Money Down.

REMEMBER—no money down—easy payments buys a master timepiece—a 21-Jewel guaranteed for a lifetime at about half the price you pay for a similar watch of other makes. No money down—a wonderful offer.

Santa Fe Watch Co.
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SANTA FE WATCH CO.
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41 Cash Prizes will be Given Away

First Prize $500

Big Shipman-Ward 30th Anniversary Contest Open to Every Reader of This Publication. No Purchase Necessary. No Obligation! —

Here's an amazing offer! A contest that's *different* from anything you ever heard of before! It means real money for you. And there's no obligation, purchase, lottery, guessing, fees, or payments of any kind! We are *giving* $1,500 away, and anybody in the U.S., except our employes, is eligible!

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Sixth "	50.00
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Twelfth "	25.00
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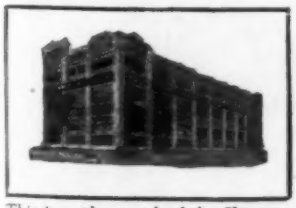
TWENTY-FIVE $10.00 PRIZES

We make this big contest offer in celebration of our thirtieth business birthday. Since 1892 this company has been in business in Chicago, and boasts over 337,000 enthusiastic customers. It isn't necessary to own a Shipman-Ward Rebuilt in order to compete in the big profit-sharing contest. Any reader of this paper, excepting our employes, is eligible. Just sign the coupon to the right, and get the full details now.

Our contest plan is so simple that anyone has a good chance of winning. Don't delay, get *your* chance to win hundreds of dollars in cash absolutely *FREE*. Just sign the coupon and mail it as soon as possible. That's *all*—and you're under no obligation. So tear out the coupon *now!*



This is a photograph of the Shipman-Ward Plant. The big Anniversary contest marks the 30th year of this company in Chicago. In this plant are manufactured the famous Shipman-Ward Rebuilt Underwoods.

Reproduced from an Actual Photograph of One of Our Rebuilt Underwoods.

Guaranteed Five Years

$3 DOWN Puts It In Your Home

Yes, that's just what we mean. This genuine Shipman-Ward Rebuilt Underwood sent to you for ten days' free trial. Put it in your home by paying $3 down—we'll refund that $3 and pay transportation charges both ways if you don't want to keep the Underwood. See for yourself—compare our Underwood with *any* other typewriter, any make, at any price. If you decide to keep it, you can pay on easy monthly payments—little more than rental.

Less Than Factory Price

Just think of it! *Less* than the factory price of a new Underwood and yet it's impossible to tell a Shipman-Ward Rebuilt from a brand new machine in appearance, durability or quality of work. The same three full-size models being made and sold by The Underwood Company today—the same up-to-date features! Two-color ribbon, back-spacer, stencil device, automatic ribbon reverse, tabulator, etc. And the famous Underwood feature—*absolutely* visible writing—the entire line of typewriting is visible at all times. *Standard 4-row single shift keyboard.*

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Remember, it doesn't cost you a penny to try the machine. Then, you may pay cash at a substantial discount, or monthly payments so small that you will never miss them. Either way you get the world's standard typewriter at a big cash saving to you. Get all the facts now—mail the coupon today.

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THE LIGHTNING COIN CHANGER

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☐ Also send me your beautiful Catalog and tell me how I can get a Shipman-Ward Underwood for $3 down. This does not obligate me to buy.

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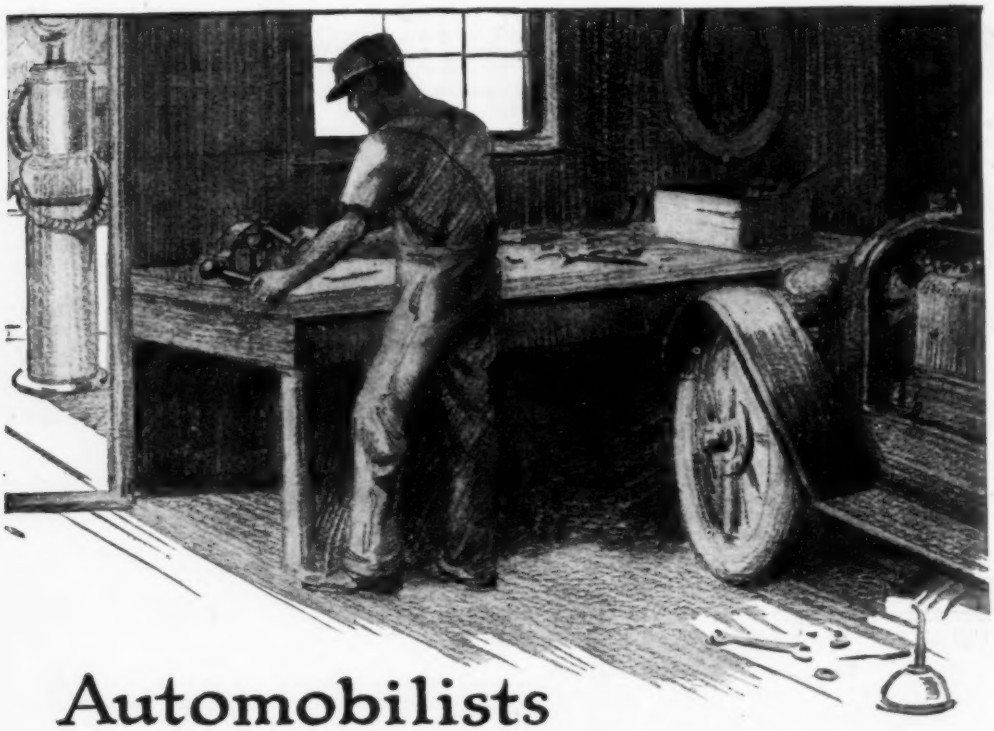

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Starrett

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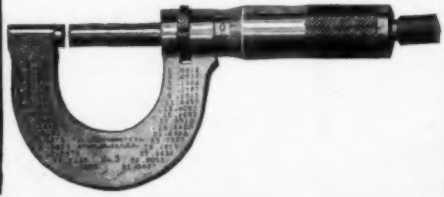
Contains six leaves particularly adapted for adjusting motor tappets. Also useful for gaging slots. The six leaves have, respectively thickness of .0015, .002, .003, .004, .006 and .015. Auto mechanics have been looking for this tool.

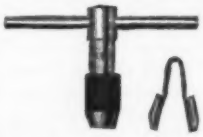
who know Starrett Tools prefer them for their superior quality, more efficient design, greater durability and dependable precision.

When they buy Starrett Tools they know they're getting value for every penny spent. Illustrations and complete descriptions of the entire Starrett line of fine tools are given in the Starrett Catalog No. 22AP and special Supplement of new tools. Copies free on request.

THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
ATHOL, MASS.



Starrett



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An extremely handy tool for holding practically all small tools to be turned by hand. New clamp construction insures firm grip on tool. Heat treated jaws guarantee durability.

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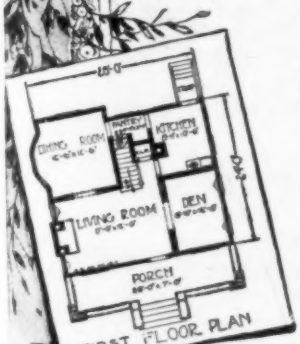
The combined efforts of these great departments in experimenting and testing materials and methods of construction have produced for you a GUARANTEED home, expert machine cut, bundled and marked—the last word in building economy.



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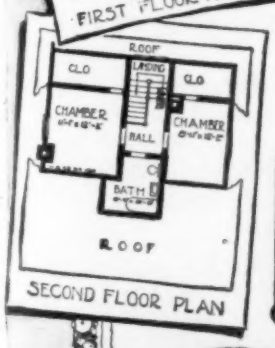

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The wonder buildings of the age. Guaranteed buildings, for quick Industrial housing. Individual Homes, etc., extra strong, practical and suitable for all year 'round habitation in any climate, 50 different plans. They come to you in easily handled sections—painted and stained, ready to bolt together and move in.

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Department NM-7

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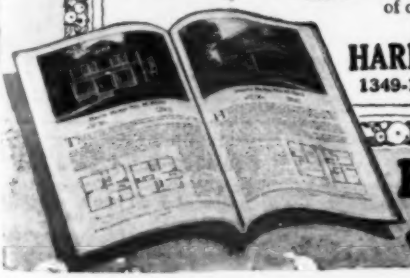

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HARRIS BROTHERS CO.
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These books are FREE and sent post paid. Mark an "X" in the squares to indicate which ones you wish.

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- ☐ Book of "Presto-up" Houses and Garages
- ☐ Building Material Catalog
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$4 Down Brings This BRAND-NEW TYPEWRITER

Pay the balance in small monthly payments. We will ship the typewriter to you for ten days' free trial.

The Annell' is Standard in size, appearance, construction and mechanical operation, with *an action so smooth and a touch so responsive* as to be a source of constant pleasure to the experienced operator, and making the progress of the novice immeasurably easier. It turns out beautiful work. The type is clear, clean-cut, hard; the alignment and spacing are utterly perfect. The speed is unlimited; no operator can crowd the Annell'. Extremely simple in construction, it is trouble-proof, sturdy, and will last a business lifetime. It embodies the ideas and experience of mechanical geniuses who have been making typewriters and typewriter improvements for generations.

Every Operating Feature

The Annell' has every late-style feature and **modern operating convenience** — each letter **completely visible** as written (together with all the previous writing), Back Spacer, Tabulator, Two-Color Ribbon, Right- and Left-Hand Shift Key, Shift Lock, Margin Release, Adjustable Line Spacing, Adjustable Margin Stops, Paper Release, Automatic Line Spacer on Carriage Return, Adjustable Paper Fingers, etc., also the **42-key, 84-character** Universal Keyboard. Rubber cover and all extras shipped with each machine.

Big Saving—Over a Year to Pay

We are **the only company** selling a Standard 42-key, 4-Row, Brand-New Typewriter direct to the user by mail at practically the **wholesale price** of other high-grade typewriters. Our remarkably low price and monthly payment plan enable you to buy a **brand-new** typewriter easily and conveniently—over a year to pay.

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We protect you with an ironclad guarantee against any flaw in material or workmanship.

No Risk—10-Day Free Trial

We will prove its high-grade quality by sending the Annell' to you for ten days' trial. Use it on any of your work. If not satisfactory, return the machine to us. **We will refund the express charges and any money you have paid,** and the trial will cost you nothing. You are the only judge. Could anything be fairer?

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The Utmost in Value

MORE than merely low price sets Ingersoll apart from every other watch. There are other low-priced watches.

Ingersoll watches are reliable, sturdy, honestly good-looking, as well as sold for so little money. Your dealer will show you the complete line.

Announcement

By an arrangement completed on March 31st, the Ingersoll assets were purchased by the Waterbury Clock Company. Thus Ingersolls are now marketed directly by the manufacturers, who have made Ingersolls from the beginning.

Waterbury Clock Company

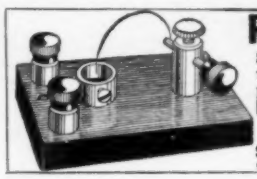
Factories: Waterbury, Conn.

Sales Offices

New York
137 Centre St.

San Francisco
360 Fremont St.

Chicago
215 W. Randolph St.



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Dealers get our prices on Panel Switches and Binding Posts.

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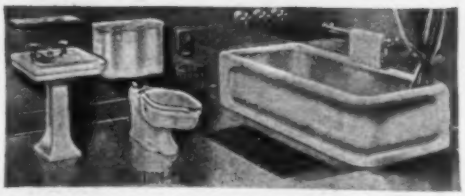
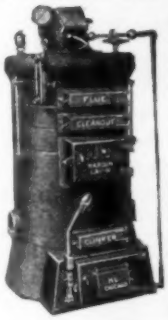
Send for Our Big Handy-Man Plumbing and Heating Encyclopedia



It shows and explains our NEW EASY METHOD—how to save skilled labor, unnecessary material and heavy work. Any handy man can do the installing with our simplified systems and working plans. OUR NEW EASY METHOD saves much cutting, threading, time and material. Even if you are a plumber the big saving by using our products and NEW EASY METHOD will surprise you.

Big Book Saves Labor and Material

Every builder, mechanic, farmer, etc., needs this BIG INSTRUCTIVE PLUMBING AND HEATING ENCYCLOPEDIA. Besides being our wholesale catalog, it contains hundreds of floor plans, elevations, diagrams and installing sketches from the simplest to the most difficult systems, showing our EASY METHOD of installing your own plumbing or heating, gives hundreds of mechanical rules, kinks, receipts, short cuts, etc., how to lay out plumbing and heating, estimate costs, repair leaks, etc. It shows and describes over 10,000 FACTORY FITTED plumbing and heating fixtures and supplies with wholesale prices; helps you to select the best plumbing outfit, or heating plant, to meet your needs. Any handy man can do the installing with the aid of OUR HANDY-MAN PLUMBING AND HEATING ENCYCLOPEDIA.



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Please send complete catalog of Icy-Hot products.

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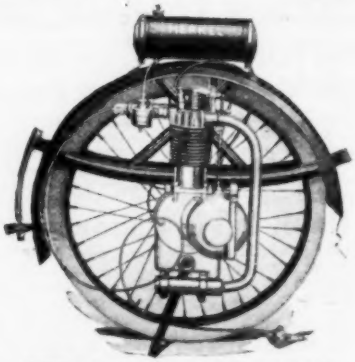
HERE IT IS



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One quality battery—the best Westinghouse can build!

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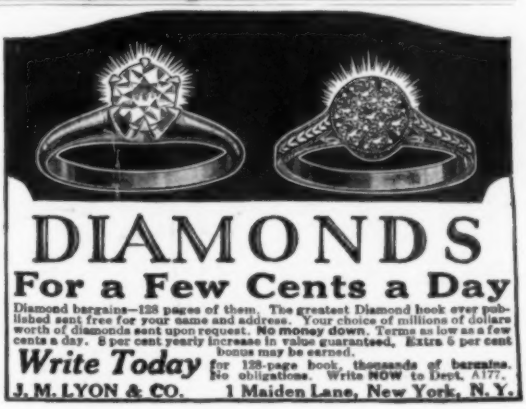
WESTINGHOUSE BATTERIES



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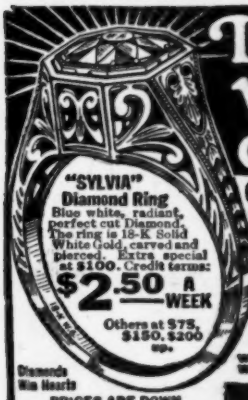

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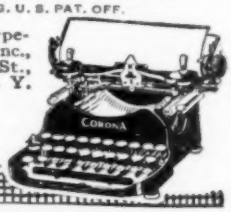

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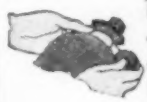

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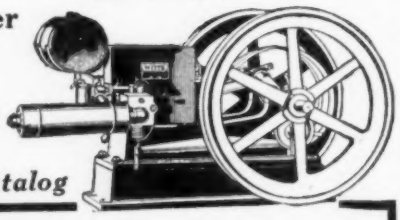

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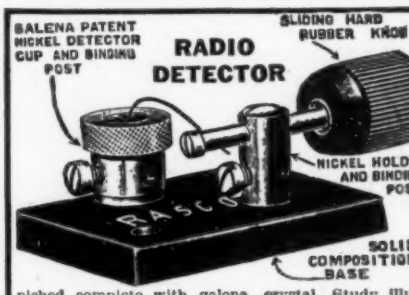

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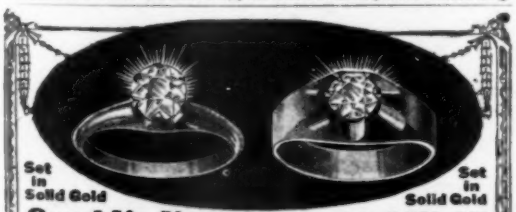

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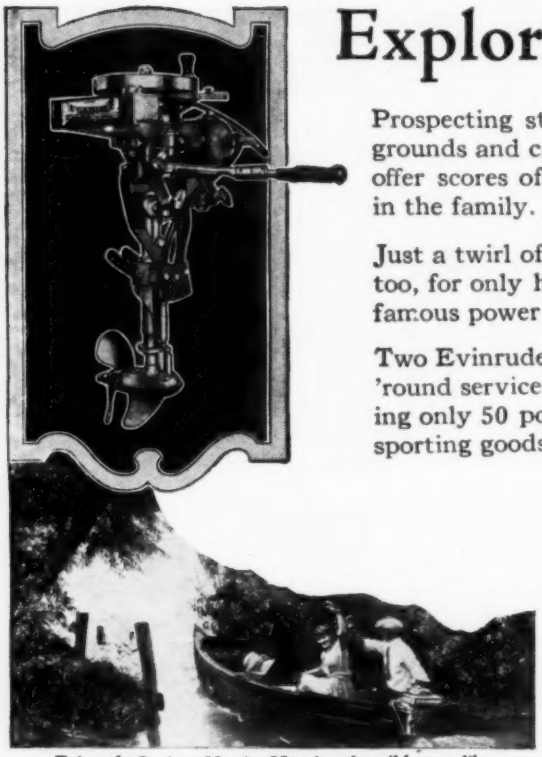

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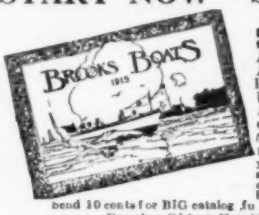

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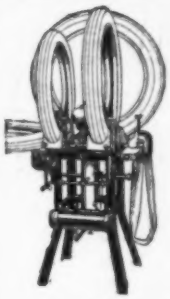

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Dayton Bicycles

"Leaders Since Your Dad Was a Boy"

have been the selection of winners since your Dad was a boy. Made complete in our own enormous factory; manufactured by men who have given their brain power for years in assuring every Dayton bicycle owner that his is "a bicycle for champions." These men are working for you.

Do this right away: Get our new booklet —"How to Choose a Bicycle." It will be sent free and postage paid if you will use the attached coupon. This booklet tells a lot about bicycles in general, and the Dayton in particular. Write for it NOW. Use the coupon.

Cycle Division
The Davis Sewing Machine Co., Dayton, O.

FILL IN—CUT OUT—MAIL TODAY

The Davis Sewing Machine Co., Dayton, O.

Please send me, without obligation, your booklet No. 28, "How to Choose a Bicycle" and the 1922 Dayton Catalog.

Name.....

St. and No.....

City and State.....

Age.....

2 TIRES FOR $11.95

FREE TUBE WITH EACH TIRE

SENSATIONAL CUT IN STANDARD TIRE PRICES!

Two used tires for less than the usual cost of one, **and a free inner tube with each tire!** *No double treads or sewed tires.* Our big volume means best tire values. Act now and cut your tire cost in two. Thousands of steady customers are getting full mileage out of these tires and you, too, can get **8,000 MILES**

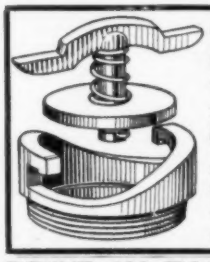
You can see the mileage in our tires. Order and prove it—but order now! This is a special lot selected for record-breaking sale. Supply limited and going double quick.

NOTE THE BARGAIN PRICES ON TWO TIRES OF SAME SIZE

Size	1 Tire	2 Tires	Size	1 Tire	2 Tires
30 x 3	$ 7.25	$11.95	32 x 4½	$13.45	$21.45
30 x 3½	8.25	13.95	33 x 4½	13.95	22.45
32 x 3½	9.45	15.45	34 x 4½	14.45	23.45
31 x 4	10.65	16.90	35 x 4½	14.95	24.90
32 x 4	11.85	19.75	36 x 4½	15.45	25.45
33 x 4	12.45	20.90	33 x 5	15.65	25.95
34 x 4	13.25	21.95	35 x 5	15.90	26.45
36 x 4	14.95	25.95	37 x 5	16.45	26.95

SEND NO MONEY! Shipment C.O.D. express or parcel post. Examine tires on arrival and if not fully satisfied return same at our expense and your money will be promptly refunded. State whether straight side or clincher.
DON'T DELAY! ORDER NOW!

ALBANY TIRE & RUBBER COMPANY
2721 Roosevelt Road Dept. 164F Chicago, Illinois



"JIFFY CAP"

Make Full Time Money Selling a 100% Ford Necessity—Not Just an Accessory!

Every Ford owner is a "sold" prospect because he avoids the disagreeable five minutes of sweaty, greasy struggling with gritty or crossed threads that he spends in filling his gas tank.

The **Jiffy Cap** brings smiles to his face as you demonstrate it, and his hand is in his pocket before you finish talking. This article sells for $1.25.

Write today for our attractive selling plan. A sample will cost you $1.00.

CHICAGO AUTO SPECIALTY CO.
1349 Bauwans St. Chicago, Ill.

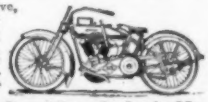
DRIVE 100 TACKS AND SAVE $25.00

$5.20 up Delivered

Ford Roadster Top Recovering $5.20, Touring $6.95, with celluloid lights in back curtain. With beveled plate glass lights. Ford Roadster $8.20, Touring $9.95. Chevrolet, Dodge or Maxwell Roadster $10.45, Touring $13.95. All other 5 passenger cars $16.50, with plate glass lights. Gypsy Side Back Curtain like cut, Ford $2. Other cars $3 extra. Ford Side Curtains that open with doors, Roadster $10, Touring $16. Ford regular Side Curtains, Roadster $6.50, Touring $8.90. Other cars $11.50 up. Ford Seat Slips, Roadster $3.15, Touring $6.25, or tailored, Roadster $6.20, Touring $9.90. Other cars $4 to $32. Ford Cushions $5.75. All goods same as car mfrs. use and guaranteed to fit. Printed instructions given how to apply. Give model and year of your car. Send ½ with order, and will ship C. O. D., or send for samples. Prices above include War Tax Paid and delivered at your door.

AUTO EQUIPMENT CO., 32 Canal Street, Cincinnati, Ohio

$45 Buys This Motor Cycle



It's a Harley-Davidson, 16 HP., twin chain drive, magneto and clutch. It has power and can get up and go on the open road at a speed which thrills. This is only one of hundreds of bargains in used motor cycles which you can get. Send for Free Catalog. It tells of big bargains and tremendous values in used motor cycles. Repairs quickly done. Motor cycles exchanged. Send us your machine to be overhauled.

Oliver Cycle and Motor Co., 1045 N. Grand Ave., St. Louis, Mo.

MOTORCYCLES

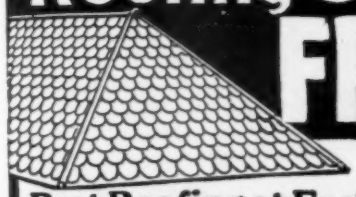
RELIABLE STANDARD MAKES that you can **DEPEND** on.

Enjoy the glorious experience of going wherever you like—whenever you like. The price is within your means—35% to 50% less than others. These machines are slightly used, thoroughly overhauled or rebuilt.

Send for catalogue.

MYEROW BROS.,
258 Columbus Ave., Boston, Mass.

Roofing Book FREE



World's Best Roofing at Factory Price

Don't buy Roofing of any kind until you get our big Free Roofing Book, describing full line of Edwards Famous "Tightcote" Galvanized Roofings, Sidings and Ceilings, and our lowest factory prices. Then see for yourself how much we save you by selling direct and saving you all in-between dealers' profits.

EDWARDS "REO" Metal Shingles

Absolutely rust proof. By our patented "Tightcote" process, edges as well as sides of metal sheets are heavily coated with zinc—not a space the size of a pin point exposed to weather. Fire and lightning proof. Outlasts three ordinary roofs. Forever wind and weather proof. Need no repairs—end all roofing expense. Patent INTERLOCKING DEVICE makes water tight seams—all nail heads covered—no chance for rust or leaks.

EDWARDS Galvanizing Test

Edwards "Tightcote" Galvanized Roofing can be bent, twisted or struck by lightning, and the galvanizing will not crack or flake. Bend it or hammer it—you can't loosen or scale the galvanizing. No other galvanized roofing can withstand this test.

Low Priced Garages

Wide variety of styles, all sizes of Portable Fireproof Metal Garages. Lowest prices ever made. Postal brings Big Garage Catalog free.

Write Today for free samples and proof that we can save you a lot of money on any kind of roofing, siding or ceiling you may need. Ask for Roofing Book No. 150.

THE EDWARDS MFG. CO.,
600-650 Pike St., Cincinnati, O.

MAKE YOUR **FORD** INTO THIS **SPORT CAR** $ ONLY **6.40**

Other types down to $1.50, and simple instructions show all details. Famous sure fit. Red-Ed life-size patterns. You can easily convert your Ford into this fast, snappy Sport Car as hundreds have done with a few dollars worth of material from the hardware store. No need to lay up the car. The "PAL" with conical disc wheel patterns, Pressed Metal Streamline Rear only $6.40 delivered. Built low, rides wonderfully easy. Order NOW while we can make good delivery. *Send 5c coin for illustrated prospectus of Sport Bodies, "Jifdy" Tops and "Gosum" Windshields.* Koempel Co., 84 Koempel Bldg., Guttenberg, Iowa

Keen, Classy Up-to-the-Minute

$10.00 A DAY PAID

Weekly to one man in each county taking orders for COFFIELD TIRE PROTECTORS. They prevent punctures, blowouts, stone bruises and fabric breaks. Double tire mileage. Pay for themselves on first tire; used over and over again. Pure live rubber; no metal, no fabric, no friction. Easily applied; no cement or tools required. Nothing like it. Absolute three-year guarantee. Users are boosters. Unlimited demand. Every truck or auto owner a live prospect. No capital required. Checks mailed weekly. Write to

COFFIELD TIRE PROTECTOR CO. 309 Court St., Dayton, Ohio

EARN $75.00 to $150.00 A WEEK

By Repairing and Rebuilding TIRES with the greatest Money Making VULCANIZER ever placed on the market. Does Better Work at One Third the usual Cost of Repair. You can guarantee Repair Work to outlast the balance of the tire. Complete Illustrated Instructions with each machine. We teach you how and help you to get started in this big profitable business of tire rebuilding. Complete Outfits $100.00, $200.00 and $250.00. Cash or in Payments. Write today for Circular No. BBV.

The Adams-Barre Co.
1248 North High St.
Columbus, Ohio

DELTA
ELECTRIC BICYCLE LAMP

To Work!

If YOU go or come from work in darkness—the Delta Electric Bicycle Lamp is just what you need.

Every bicycle should be equipped with this lamp which—with its strong, piercing beam—protects against accidents.

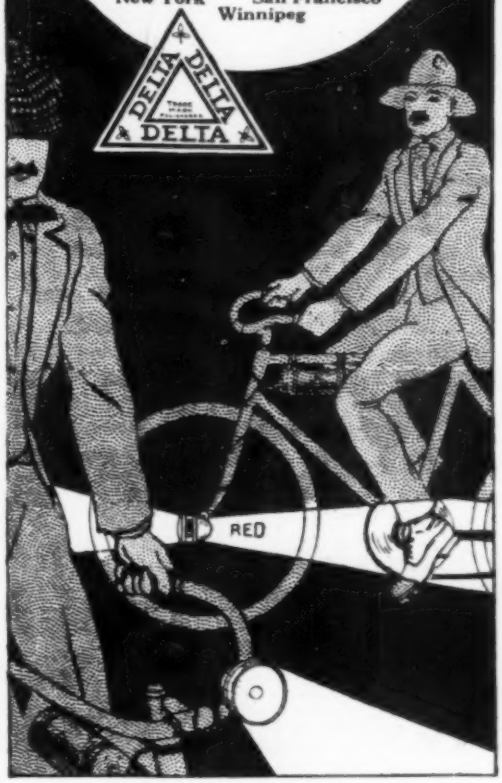
No. 80 solves problem of rear red light—complies with all the laws. Mounts left side front wheel under axle nut. No. 27 mounts on handle bar.

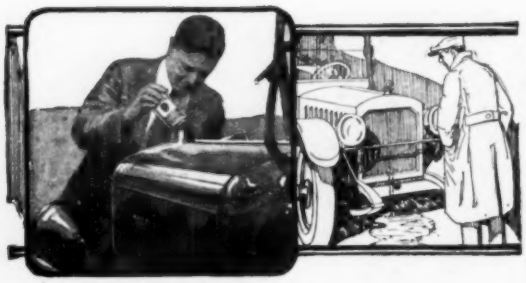
Ask your dealer, or either model sent prepaid for $2.25 complete (less Battery).

Delta Electric Company
100 DELTA BLOCK MARION, IND.

Standard Makers of Electric Lanterns, Automobile Spotlights, Bicycle Lamps, Flashlights and all kinds of Dry Batteries.

New York San Francisco
Winnipeg





Miracle No. 1

Radiator frozen. Result—steady leak in lower left corner. Couldn't spare car for expensive repairs. Poured

RADIATOR NEVERLEAK

into radiator and completely stopped the leak.

This happened three months ago. Repair solid as ever. Time lost—5 minutes. Cost—75c.

If your dealer hasn't Radiator Neverleak, send 75c for full size can. Guaranteed satisfactory or money back. Carry a can for emergency.

Buffalo Specialty Co.
BUFFALO, N. Y.

TWO-YEAR GUARANTEED BATTERIES SAVE 50%

© 1921

SPECIMEN PRICES
Ford-Dort-Chev. $18.80
Overland-Buick 21.85
Maxwell-Dodge 25.60
Same 50% saving on all cars

Famous **"Royal" Batteries**—highest quality made—now selling direct from factory to car owner. You save half. We give **written** 2-year guarantee—longest on any battery. Big responsible organization backs guarantee. **Batteries for any car, tractor or gas engine.**

Send no money Save time. Order from this ad. Battery, fully charged, shipped immediately—by express C.O.D. You run no risk. Our location same for eight years. References: Nat'l Bank of the Republic, Dun or Bradstreet.

Free Booklet If you want descriptive matter first, send for free booklet. Gives full details of this superior battery. Get this booklet **before** you buy **any battery. Write today!** Give year and model of your car.

K-E BATTERY CO., Dept. 108
646 N. Michigan Blvd., Chicago

Largest Exclusive Mail Order Battery House in America
Members of Chicago Association of Commerce

EARN $150.00 A WEEK BY YOURSELF with a DUNCAN VULCANIZING PLANT

Includes every tool and vulcanizer for a high-grade repair business. Will handle the work of six men.

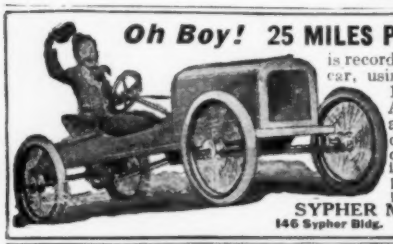
We start you in business for as low as $125.00, balance easy monthly payments, and teach you approved factory methods of tire repair, at home or in one of our own repair shops, FREE; also pay you $5.00 to $6.00 per day for the last eight to ten days, when you take the course in one of our repair shop schools, in connection with the purchase of a No. 10 or No. 3 Equipment.

Can you beat this big chance to own your own business upon so small a capital?

The Duncan will cure two or three times as many tires a day as any other mould. It is the only mould made that will operate with sand bags equally as well as with air bag.

F. M. DUNCAN COMPANY
Offices and Factory: 341-349 East Ohio St., Dept. 5, Chicago, U. S. A.

Oh Boy! 25 MILES PER HOUR!



is record of our stock car, using our special 1922 motor. Anybody can assemble this car. Send 30 cents for plans, instructions and price list of parts.

SYPHER MFG. CO.
146 Sypher Bldg. TOLEDO, OHIO

Make Full Time Money

Selling a 100% Auto Necessity—Not Just a Rich Man's Accessory

Every car owner is a "sold" prospect because he realizes his need for an **accurate, easy, clean** way to save his tires by knowing that they have just exactly enough air. *"Hurry Accurately"* You can take his order for this guaranteed money back VISIBLE TIRE TESTER by a simple demonstration. Sample $2.25. Write today for our attractive selling plan.

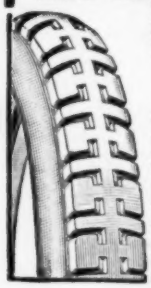
Sells for $3.00 —a fair price

Chicago Auto Specialty Co., Inc., 1349 Bauwens St., Chicago, Ill.

LEARN HOW TO GET FREE TIRES *FOR YOUR OWN CAR!*

1000 more Car Owner Agents wanted at once. Write for full conditions on which full set of famous new process Full Mold Oversize Multiple Weave INTERNATIONAL Tires given FREE to Agents in Exclusive territory! Rock bottom wholesale prices and free wonderful fast selling plan given you right from the start. All tires 8000-mile guaranteed Non-Skids!

AND READ THIS GUARANTEE!



To any person returning an international tire to us accompanied by a sworn affidavit that it did not give service better or equal to any other make of tire it may have been run against, regardless of price, **we will replace such tire absolutely free of charge!**

INTERNATIONAL TIRES
PIRON (No-Rip) TUBES

We need not remind you that this offer of FREE TIRES to live agents, exclusive agency, biggest discounts and ironclad guarantee will get us the required agents almost overnight. Get all the details now! Be in business for yourself! Tie up your own territory with these FREE TIRES and your first order.

DO NOT DELAY—OFFER IS LIMITED!

All information as t. this great FREE TIRE and AGENCY OFFER is sent you free, together with bank references. Write us for them AT ONCE!

Dept. 109 INTERNATIONAL RUBBER CORPORATION, Grand Rapids, Mich.

BIG PAYING HOTEL JOBS OPEN

to trained men and women; we train you by mail; get 20 years' hotel experience in few months; earn $5,000 to $10,000 a year; fine living; work is fascinatingly interesting; quick advancement. Send for FREE BOOK today!

LEWIS HOTEL TRAINING SCHOOL, Room 329, Washington, D. C.

CUSTOM TAILOR MADE

To fit your individual car

$4.40 and up Parcels Post Paid

Made in our custom shops after your order is received. We ship ordinarily in 2 or 3 days. Perfect fit guaranteed when correct name, year and model of car is given. You can easily apply it yourself. We furnish instructions and all necessary tacks, welts and fasteners. Our catalog No. 10, with samples, is free for the asking.

LIBERTY TOP & TIRE CO., Dept. E-7, Cincinnati, O.

SEND for the INTERNATIONAL CATALOG

Factory to Consumer direct—

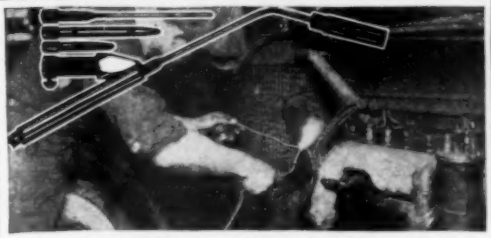
PAY ONLY ONE PROFIT

Our net price list of auto bodies and body supplies at **Wholesale Prices.**

Save big money by buying **Direct from Factory**

For Ford and Chevrolet—prices from $27.85 up

International Body Works 914 W. Ohio Street, Dept. 7 **Chicago, Ill.**



A Torch with Hundreds of Profitable Uses

Torit Acetylene Torch No. 13

PRODUCES A HOT INSTANT FLAME

For radiator and battery repairing, for soldering electrical connections, pots, pans, etc.; for preheating fenders, tempering tools, joining brass tubing, removing rusty bolts and nuts; for light brazing and hundreds of other uses.

A Practical Outfit for Every Mechanic

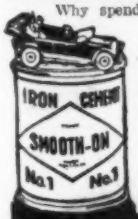
Uses Acetylene Gas Only

Complete with 4 different tips and soldering copper, rubber tubing and tank connection.. **$7.50**

ST. PAUL WELDING & MFG. CO.

177 W. 3rd St. ST. PAUL, MINN.

MOTOR REPAIR BOOK FREE



Why spend dollars, when you can make perfect Automobile and Household repairs quickly and easily with **SMOOTH-ON IRON CEMENT No. 1** at a few cents' expense? Write for this book and learn how—it's **Free.**

Smooth-On is sold in 6 oz., 1 lb. and 5 lb. tins by Hardware and Auto Supply Stores

SMOOTH-ON MFG. CO.
Dept. 37E Jersey City, N. J.

SMOOTH-ON IRON CEMENT No. 1
For Motor and Household Repairs

Make Your Bike a MOTORCYCLE

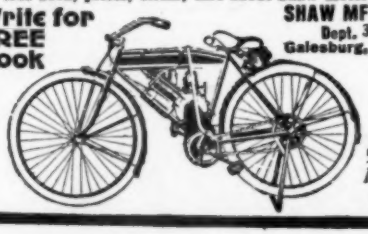
Make your "foot-power" bike a dependable, easy-running, light-weight motorcycle at small cost. You can do it yourself with the

SHAW MOTOR ATTACHMENT

Compact. Easy to attach. No special tools required. Battery or magneto. Thousands in use. Write at once for free book, prices, terms; also about Shaw Motorbicycle.

Write for FREE Book

SHAW MFG. CO.
Dept. 375
Galesburg, Kans.



95 to 125 Miles per gallon!

Please Mention Popular Mechanics

Saturday and Sunday Afternoons

What fun to be able to ride wherever you like, in a machine you can afford —an

Indian Motocycle

60 to 70 miles to the gallon, all upkeep correspondingly low, no garage rent. Comfortable, easy to ride and handle. Cheaper than carfare to ride to work.

Write for literature covering the 1922 models.

Numerous Improvements.

Two brand new models.

Substantial price reductions.

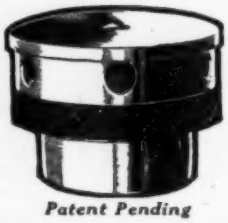
Address Dept. 37

Hendee Manufacturing Company

Largest Motorcycle Manufacturer in the World

Springfield Mass.

Eventually on All Fords



Patent Pending

The F-B-Oil-Saver

Does All These Things or Money Back

Prevents oil-pumping. Saves 25% to 50% of lubricating oil.

Reduces carbon.

Ends spark plug fouling.

Keeps oil dirt-free.

Reduces wear—improves lubrication.

Saves gasoline.

Stops all oil-leakage.

Sells for $1.50

Dealers and Agents Make $10—$30 a Day!

Dealers and agents make wonderful profits selling the F-B-Oil-Saver.

It saves more money for Ford owners than any device ever brought out. Note at left what it does.

A Sure Sale Nearly Every Time

Agents close from 50% to 75% of all prospects talked to. Just put it on a Ford. Show the owner what it does. Only an instant to demonstrate. No tools, no installation costs.

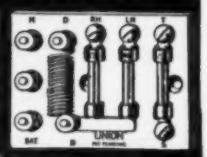
Hundreds of agents make from $10 to $30 a day. No mechanical ability needed. The F-B-Oil-Saver sells itself. Satisfaction or money back guarantee, on every sale. We back you on that. Dealers make big money, too. All Ford owners want this device. Write for our proposition. State whether dealer or agents rights wanted.

Don't wait. Good territory is going fast. Write at once.

PENINSULAR CORPORATION, DETROIT, MICH.
1148 Penobscot Building, Dept. E

Ford Owners

End Lighting Troubles with "Union" Fuse Junction Block



Prevents wires burning from grounds, or lamps flickering due to loose connection. Cuts repair bills. Eliminates fire danger.

Permits use of standard lamps for bright or dim lights instead of high-priced double-filament type. Easy to install. No additional wiring.

Sent postpaid for $1.50 if not at dealers. Money back if not satisfactory. Write for booklet.

CHICAGO FUSE MFG. CO.
1503 W. 15th St., Chicago **Eastern Branch, New York**

FORD and CHEVROLET SPEED BODIES

Dealers: Write for Accessory Catalogue

MAKE DRIVING A PLEASURE

Equip your old Ford or Chevrolet Chassis with one of our new distinctively modern bodies. Up-to-date Roadster, Touring and Speedster designs. Ford bodies as low as $29.50 and up. Territory open for live wire dealers and agents. Make real profits.

Buy Direct from Factory

FEDERAL MOTOR SUPPLY CO., Inc.
1424 S. Blue Island Ave. **Chicago**

CANADIAN DISTRIBUTORS
Federal Auto Body Co., Toronto, Ont.; Campbellton, N. B.

Small Cash Payment-Balance Easy Terms

$20 Puts an HB Charger in Your Shop

Balance in easy monthly payments. **HB Battery Charging will carry your overhead.** No repairs, no renewals, steady, money-making service. **Costs you 4c to 12c per battery, customer pays 75c to $2.00.** Quicker, better service with an HB, at lowest cost, means Big Monthly Profits for you. **Sold on money-back guarantee.** Sizes for 8, 10, 16 or 32 batteries. Let us recommend size to fit your needs. Write today. **Ask about HB Air Compressors, Motor Grinders, Tire Buffers, Lighting Generators, Ball Bearing Motors,** etc.—all sold on easy payments. Equip your shop to make more money. Write us.

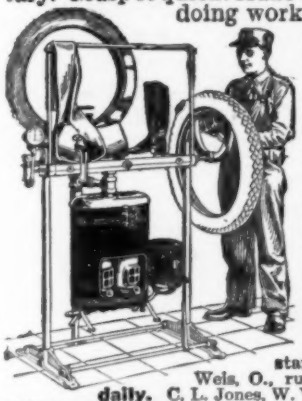
HOBART BROS. CO. **Box M6** **TROY, OHIO**

HOBART BROTHERS HB TROY-OHIO

Battery Charging Pays $1500 to $3000 a Year

Make $1,000 Easy!
From Evening Work

Skidmore of Ohio started last Nov. Has made **$3000** to date! Greatest proposition of century. Grasp it quick! Make **$30** to **$50** a week doing work at home evenings.



Do Not Quit Your Job

Make big money on side. Turn spare hours into cash with my **new home outfit.** Vulcanize automobile tires. Mend tubes. Repair gum boots and rubber goods of all kinds. Do **thriving neighborhood business.** Many men started economically. L. D. Weis, O., running better than **$15 daily.** C. L. Jones, W. Va., averaging more than **$47 day** during past six weeks, and so on.

Little Money Starts You!

Write me. Get my help. Begin **now.** Season **just opening.** Tire repair **work** galore **everywhere.** I furnish **everything,** including machine, tools, clamps, materials and directions. No experience needed. Everything **plain and easy.** All instructions **learned in one evening.** Can't go wrong. Marvelous proposition. Wm. Howe, Mo., says: "Biggest little machine I ever saw." Steve Marchand, Texas, writes: "Am having wonderful results with your machine." Others are making **extra money**—you can too!

Mail Postal To Me, Tonight!

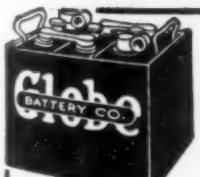
Get full details. It's a proposition you can handle. Place machine anywhere—garage, shed, basement. Has **wonderful capacity.** Work is **easy, pleasant** and **fascinating.** Starts you in big paying business. Puts you on road to independence. Send quick for full information. Address me personally. M. Haywood, Pres.

Haywood Tire & Equipment Co.
974 Capitol Ave. Indianapolis, Ind.

CORONA CAR Co.

The Sport Car DE LUXE
The Car for Young America
Eighty Miles to the Gallon
A Day's Ride for a Dollar
Half the price of a Flivver

1912 SOUTH WABASH AVE., CHICAGO



SAVE MONEY

Buy your automobile battery direct from factory—highest quality made. You save 50%.

Globe Batteries

For the past two years Globe Batteries have been sold to some of the biggest users of automobile batteries in Chicago. Names of these satisfied users furnished on request. These same batteries listed below. Save time. Order from this ad. Batteries shipped immediately—express C. O. D.

WRITTEN TWO-YEAR GUARANTEE

6 VOLT 11 PLATE
for Overland, Elgin, Ford, Scripps-Booth, Grant, Dort, Saxon, Hupmobile, etc. Usual Cost $32.00. **Our Price** **$12.50**

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Volts	Amps.	Price	Volts	Amps.	Price
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Mellinger Hand Made, over-size Cords and Extra Ply Tires — the finest, most serviceable tires made. **I GUARANTEE MILEAGE**—some do not. Whether you want CASH or guaranteed mileage for yourself at LOWER WHOLESALE PRICES, **write me today.** Get my inside figures and discounts. My **new low prices amaze everyone. Better tires for less money** makes business roll in. One Billion Dollars will be spent for Tires in the next few months. Tires are shipped prepaid on approval.

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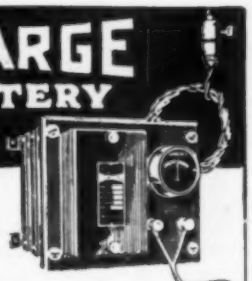

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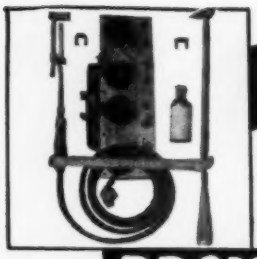
Largest Manufacturers of Rectifiers in the World



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Study the specifications of this Motor—Make comparisons—You will not find its equal at anything near our price

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Six Machines in One

Does the hundred-and-one things so often desired, with a speed and accuracy that is amazing and at a cost that is ridiculously low.

Especially adapted for cutting all kinds of wood, fibrous materials, and soft metals up to 1½" thick. It will make easy such difficult operations as cutting-off, ripping, mitering, rabbetting, grooving, cutting tenons, etc. Special attachments simplify polishing, buffing, grinding, sanding and drilling.

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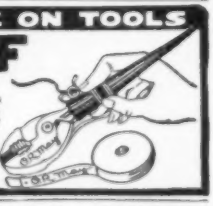

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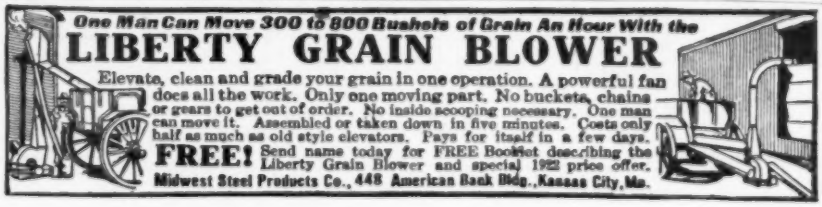

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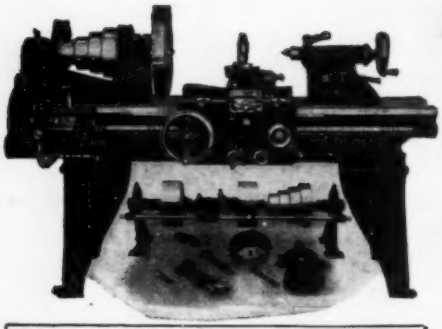

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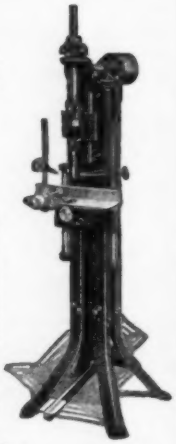
$90



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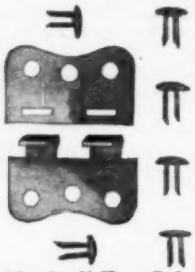
PARKS

WOODWORKING MACHINES

LAKEWOOD FAN BELT FASTENERS



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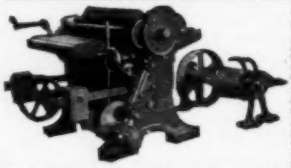

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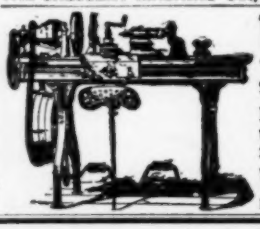

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¼ hp. A. C., Fan-Cooled
Split phase 110 volt, 60 cycle

$13.50 F.O.B. Chicago

Rated ¼ hp, but tested at the factory for 50% overload. Motor weighs 24 lbs. bare—not a toy, but a sturdy high-power, electric motor, suitable for operating bench lathes and drill presses, grinders, radio sets, washing machinery, churns, cream separators, big ventilating fans and the like. Operates at 1740 rpm.

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Same motor with Grinder and Buff—6 inch motor wheel and 7 inch buff, complete with cord and plug **$25.00**

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ONE-HAND-Y ELECTRIC DRILL

Weight 3 lbs.

Capacity ¼ in.

Westinghouse Universal Motor Guaranteed

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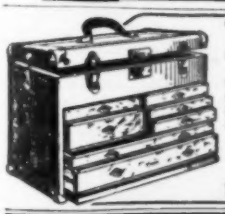

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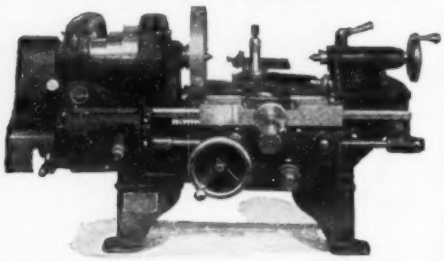

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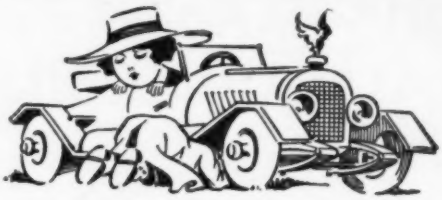

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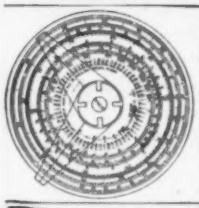

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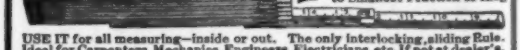

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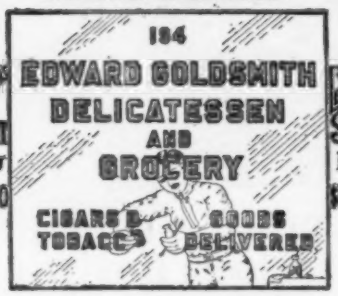

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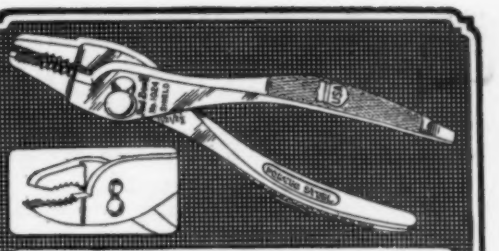

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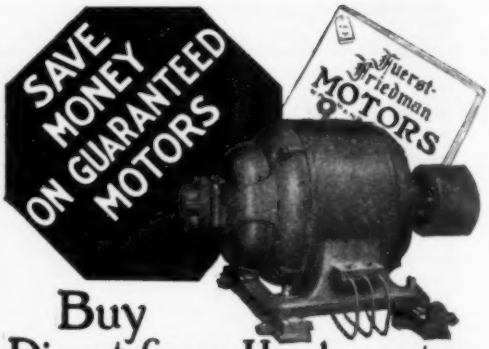

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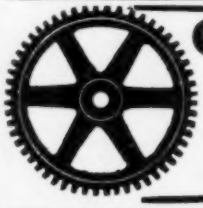

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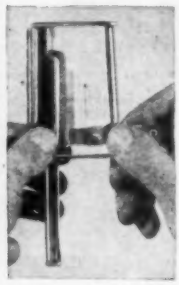

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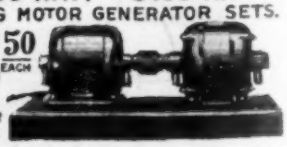

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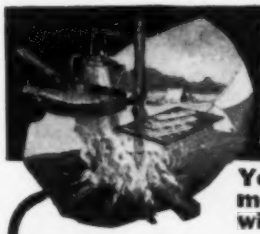

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HERE is the ideal all-purpose craft—The Moto-Row—combination power and row boat at a price made possible only by quantity production.

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These amazing, beautiful CORODITE diamonds positively match genuine diamonds in every way—same glitter, flash and dazzling play of living rainbow fire. They, alone, stand the diamond tests, **including the terrific acid test.** Even lifetime diamond experts need all their experience to see any difference. Prove this yourself.

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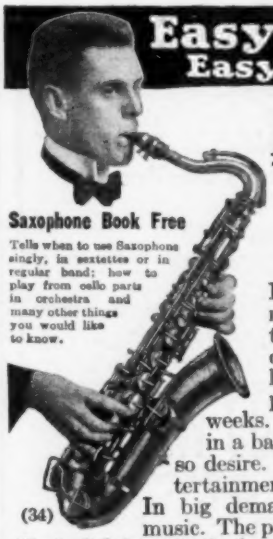

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SAXOPHONE

Easiest of all wind instruments to play and one of the most beautiful. You can learn the scale in an hour's practice and play popular music in a few weeks. You can take your place in a band within 90 days, if you so desire. Unrivalled for home entertainment, church, lodge or school. In big demand for orchestra dance music. The portrait above is of Donald Clark, Soloist with the famous **Paul Whiteman's Orchestra.**

(34)

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Squabs are selling at the highest prices ever known. Breed them and make money. Write at once for free book, prices, etc.
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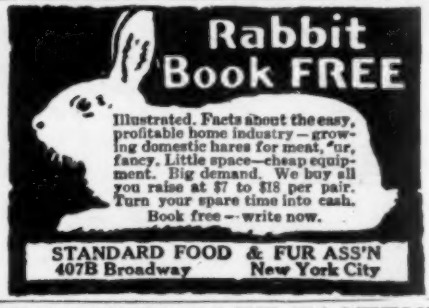

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Drop the eyelets into the magazine and go right ahead. Order from your stationer or direct.

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Make $200. to $1000. Profit Monthly

With Balba Perfume Sales Machines

People love perfume. Men, women and children will buy Balba. Its fragrance is soft and lasting and it is easily accessible. Just think. Grown-ups and boys and girls spent $250,000,000.00 in one year in the United States for perfume, alone, at toilet counters. Consider how much more will be spent when a dime placed in a Balba Sales Machine will bring forth a conveniently sized bottle of rare Balba Bouquet Perfume. Balba Sales Machines, the serve-self idea applied to perfume sales, are popular. One machine holds 144 bottles, and between 3 and 4 people use it daily, with a profit to the owner of $4.00 per machine per month. 100 machines bring in $400.00 profit per month and can be easily handled in spare time.

BALBA

Bouquet Perfume

Of rare and lasting quality, Balba Bouquet radiates a fragrance of elegance and refinement about the wearer. Hundreds of regular customers buy from Balba Sales Machines, 5 to 12 bottles of the soft, rich Balba perfume at one time, because they can carry them easily in hand-bag, or pocket.

25c to 50c Value for 10c a Bottle

Because all middlemen's profits are cut out by the serve-self sales plan of Balba Sales Machines, we can manufacture this high quality perfume in large quantities and give 25c to 50c value for 10c a bottle.

Sold Only Through Balba Sales Machines

To give highest quality, and largest quantity at lowest cost in an inexpensive bottle, Balba Bouquet Perfume is sold only through Balba Sales Machines, on the serve-self plan, cutting out all overhead expense. Note the attractively nickel-plated, practically thief-proof, easy to fill, simple to operate Balba Sales Machines. Weather-proof, used inside or out in small space on wall or counter.

We Want Balba Sales Machines in Every City, Town and Recreation Resort

We have thoroughly proved that Balba Bouquet Perfume is a good seller, it repeats, it makes new users. Balba Sales Machines in good locations show an increasing business, proving that the serve-self plan applied to perfume is a safe, sane, logical selling method. We are offering a tested, proven, big profit, permanent business to a live person (man or woman) in each territory. Instead of territory rights, we sell an allotment of Balba machines in proportion to population. We give the purchaser exclusive rights to sell Balba perfume in that territory. No perfume but Balba is sold like this. Balba is being advertised Nationally.

Over 500 Cities Already Taken

Over 500 towns and cities are now under contract. Every mail brings new contracts—Machines are now being shipped in large quantities and being put up daily and National Advertising is being placed—the contracts are going to men of action and vision—thousands of good cities and counties are still open but it will take quick action.

New York, Chicago, Detroit, Cincinnati, Pittsburgh, Buffalo, Des Moines, Los Angeles and Springfield, Mass., are some of the towns taken.

FREE Newspaper Advertising in Your Territory

When you have bought and placed a full allotment of Balba Sales Machines, we will run advertising in your local newspaper, giving locations of all your Balba Sales Machines. This starts people buying Balba from your machines, and the high quality of Balba keeps them buying. We tell you how to place machines and handle them. We are rapidly getting general distribution, and are placing advertising in the National Weeklies and Women's magazines to make perfume users throughout the U. S. want to buy Balba.

Guaranteed 100% Earnings or Money Refunded

Our proposition as well as our perfume is guaranteed. We guarantee 100% earnings on the original machine investment the first year, provided machines are all placed in use and kept filled, or we will refund the original price of the machines and perfume then on hand and take them back.

WHERE BALBA MACHINES CAN BE PLACED

Theaters	Bath Houses	Shoe Shine Parlors
Pool Halls	Factories	Lunch Counters
Depots	Rest Rooms	Skating Rinks
Clubs	Dance Halls	Ticket Offices
Restaurants	Lodge Rooms	Street Car Shelters
Cafeterias	Candy Shops	Ice Cream Parlors
Drug Stores	Boats	Office Building Lobbies
Cigar Stores	Moving Picture Houses	Passenger Busses
Fruit Stands	Billiard Parlors	Recreation Buildings
Street Cars	Apartment Houses	Waiting Rooms
Elevators	Public Buildings	Hotel Rooms
Trains	Bowling Alleys	Hotel Lobbies
Parks	Interurban Cars	Barber Shops

READ WHAT BALBA SALES MACHINE OWNERS SAY

George Schroder, Ohio, says, "First 100 Balba Sales Machines averaged $198.80 clear profit first month before advertising was started." Nauman, Michigan, says, "First 50 machines put up, averaged 3 plays daily. This is at the rate of $168.40 clear profit monthly without advertising."

Send 10c Coin or Stamps

—with name and address for full size bottle of Balba Bouquet Perfume. This offer is open to any one.

Be the first in your territory to make a Fortune in Dimes. Get complete information, literature and sample of Balba. Write today or better wire us to hold territory until you get our proposition. Read what Balba Bouqueteria Owners say and send for your allotment Now

THE BALBA CORPORATION of AMERICA

Suite 46, Balba Bldg., Toledo, Ohio, U. S. A.

THE BALBA CO. OF CANADA
Leamington, Ont.

NEW INVENTION
Ends Tire Troubles

A remarkably simple and inexpensive invention which makes blowouts impossible, eliminates 95% of all punctures and practically does away with all disagreeable tire changing, has been patented by Walter G. Critchlow, Suite 164, No. 716 Madison Street, Chicago. In addition to freedom from the annoyance of punctures and blowouts, users report that they get from 5,000 to 9,000 extra miles wear from their tires. Mr. Critchlow is so proud of his invention that he is making a special 30 day trial offer to every car owner, and also offers $10.00 reward for any blowout that occurs where his invention is used. He wants one representative in each locality to take care of the tremendous demand that is sure to be created wherever his invention is shown. If you drive a car or want to learn how you can make from $150.00 to $350.00 per month send Mr. Critchlow your name and address at once for full particulars, and a good size sample which he will send free of charge.

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"Beats all"

Low fuel cost
Dependable
Speedy

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150 Miles to Gallon of Gasoline

The Evans catalogue, fully describing this wonderful machine, sent upon request

Attractive offer to rider agents in territory not controlled by an Evans dealer

Evans

For an economical means of transportation there is no motorcycle like the EVANS. It performs like the heavier, costlier machines—requires no expert mechanical knowledge—is easy to handle—operates swiftly and surely.

Manufactured by

CYCLEMOTOR CORPORATION

Box 1031 - Rochester, N. Y.

FORD CAR GIVEN

Solve This Puzzle. Win Fine Prize

15	8	25	15	21
8	5	14	18	25

The figures represent corresponding letters in the alphabet. Figure 1 is A, 2 is B and so on. The ten figures spell three words. What are the words?

To Men, Women, Boys and Girls

All can share in these EASY-TO-WIN prizes. Send the three words on a slip of paper with your name and address. Besides the Auto I am going to give away Phonographs, Bicyles, Gold Watches Silverware, etc. and cash rewards. Send your answer. Act quick.

Duane W. Gaylord, 537 S. Dearborn St., Dept. 98, Chicago

Tire User

Agent Wanted

Car owner agent wanted in every community, to use, introduce and take orders during spare or full time for Harrison **Hand Made Tires** at our low prices, fully **GUARANTEED 10,000 MILES** (Not seconds) Finest materials used. Shipped on approval prepaid. Capital or experience unnecessary. Sample sections free. Write for local agency offer and get our low factory prices to user agents.

HEAVY HAND MADE

HARRISON TIRE & RUBBER CO.
230 Indiana St., Hammond, Ind.

Famous Wagner Motors

Brand new A. C. single phase, 60 cy., 110 V., 1750 RPM. motors, complete; ¼ H. P., $13.00; ½ H. P., $32.00. Brand new 3-ph., 60 cy., 220 V., 1800 RPM. motors, complete, 5 H. P., $75.00; 3 H. P., $60.00; 2 H. P., $50.00; 1 H. P., $45.00. New A. C. oscillating fans, 110 V., 60 cy., complete, 12-inch, $20.00; 16-inch, $23.00. Order your motors and fans while we have them in stock at these low prices. Our first policy, satisfaction or money back. CASH MUST ABSOLUTELY ACCOMPANY YOUR ORDER.

General Motor & Machinery Co., 601 W. Adams St., Chicago, Ill.

Attach Your Own Top

Paint your car, too. You can do it in a jiffy. Instructions make it easy and help you save mechanic's bills.

Complete new top, back curtain, large can of enamel, for Ford cars, **$9.95.** Same outfit for all other cars, **$15.75.**

Write for samples and Catalogue No. 3.

Special Offer for Dealers

A. E. Schneider Mfg. Co.

4265 Hudson Blvd. West Hoboken, N. J.

$140 Weldit Outfit For $75

In price alone, you cannot find in the open market a welding outfit that resembles a value equal to this **"Weldit"** under $140 to $165. In design, proven efficiency and every detail of actual quality it is not surpassed—we might say **not even approximated at any price.**

Preferred by such representative users as Dodge Bros., Ford Motor Co., Owens Bottle Mch. Co., Studebaker Corp., Timken-Detroit, American Shipbuilding Co., Thompson-Starrett, General Motors Corp., it has stood the severest test of years and is acknowledged to be the **highest development of acetylene welding equipment.** All of our apparatus is inspected and approved by the National Board of Underwriters.

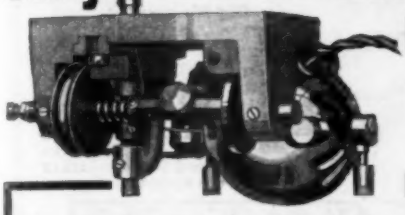
The price of only $75 is **direct to you from our factory,** backed by our reputation and **absolute guarantee.** No salesmen, commissions or dealers' profits, we prefer to do business direct with our customers at our own factory prices. Once you see this equipment you will instantly recognize the great saving and superiority of service this offer represents. **It is a value you cannot afford to pass,** if you need or use acetylene welding.

We suggest that you write today for complete information. Address:

WELDIT ACETYLENE CO., 146 West Larned St., Detroit, Mich.

Factory Prices on Everything for the Welder

Only 357 Motors Left at $10 Each



Ideal for home-made phonographs, experimental purposes and combination **phonograph-radio** sets.

We have 357 small motors which are greatly under-priced for quick clearance. You will never again equal this low price, when this lot is sold.

They are universal motors, 110 volts, 60 cycle single phase, complete with turntable, cord and socket for immediate use. 1400 R. P. M. Motor has 1" pulley with flange for ¼" flat belt. Housed in highly polished, nickel-plated shell.

Don't lose out on this remarkable offer. Order your motor today. Tomorrow may be too late. DO IT NOW! Price $10.00 f. o. b. Steger, Illinois.

Industrial Division

Steger & Sons Piano Manufacturing Company
Dept. 90, Steger Building Chicago, Illinois

WANTED TAILORING SALES AGENTS

Make big money from very start—$75.00 to $100.00 weekly. Largest made-to-measure tailoring house, furnishing an equipment of five hundred woolens, wants you to take orders. Satisfaction guaranteed. Biggest merchants in many towns have started with our line. If you want to establish yourself permanently in business and make big money, write for full particulars, giving your experience as salesman or tailor's sales agent.

P. M. HORN, Sales Manager, Lock Box 483, Chicago

THIS WONDERFUL INVENTION

converts any ordinary cook stove into a gas stove. OXO-GAS is made from kerosene and air. Cheaper, cleaner and more efficient than coal. Responsible distributors wanted.

GLORIA LIGHT COMPANY
114 N. May St. Chicago, Ill.

DIAMONDS

For Graduations, Anniversaries, etc.

Here at 60% of Market Price

This absolutely flawless diamond gem 1/2 — 1/16 ct. at $100 among bargains in recent list. Many other big values in our lists. Buy HERE! Prices based on loan values, not market values. This 75 year old *diamond banking firm* has thousands of unpaid loans and other bargains. Must sell NOW.

Why Pay Full Prices

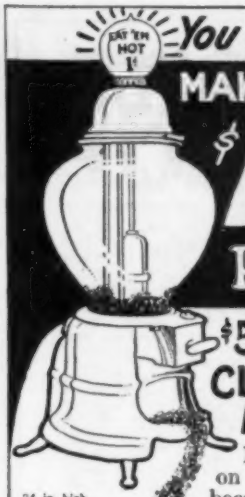
Any diamond sent for absolutely free examination at our risk. No obligation. No cost to you.

Send for Latest List

Describes Diamond Bargains in detail, gives guaranteed loan values. Explains unlimited exchange privilege. *Write for list today. Send NOW.*

JOS. DeROY & SONS 1987 DeRoy Building
Only Opposite Post Office Pittsburgh, Pa

YOU CAN EASILY MAKE $110 per week PROFIT



24 in. high. Weight 25 lbs. Toasts 8 lbs. P-Nuts at once. Set on any counter; uses ordinary electric current. Less than 2c per day operates it.

$5720.00 per Year CLEAR PROFIT *For Yourself!*

Millions have been made on the 5c and 10c store idea because these coins are freely spent. Now comes the biggest penny sales idea ever hit upon and electricity has made it possible. A 1c vending machine with new process buttered P-Nuts in plain view. It keeps them toasted; and serves them HOT. Moreover, it flashes an electric sign all day long saying **"Eat 'Em Hot--1c."**

Stands Out Like a Light House!

This sensational new type Sparta peanut vending machine absolutely **compels attention.** It gets the pennies by thousands, and serves fresh toasted Buttered P-Nuts so tempting that each customer repeats again and again. We have dozens of letters and affidavits stating that $30.00 a month is easily made by ONE well placed machine and that **$5720.00 a year is easily realized.** What you make depends entirely on how many machines you have and where they are located, and remember, a reasonable sum of money puts you in the business right.

WE SHOW YOU HOW!

We give you 50 pounds of our own Buttered P-Nuts FREE OF CHARGE with each and every machine. This means you operate without peanut cost for the first 44 days. **Your profits in 44 days will practically pay for each of your machines.** We tell you how to place each machine to best advantage in theatres, clubs, depots, barber shops and many other crackerjack locations. We send you **free,** by return mail, full and complete information on this great Business Offer.

But Remember The Good Territory is Going Fast!

We give every operator A-1 exclusive territory. Consequently this splendid offer necessarily must be limited. Send Coupon below to protect yourself in your territory and **get full details without any obligation to you.**

SPARTA MANUFACTURING COMPANY
1-3 Ionia Ave., Dept. 2216
Grand Rapids, Michigan

50 Lbs. Peanuts FREE to you NOW!

MAIL TODAY

SPECIAL FREE OFFER COUPON

SPARTA MFG. CO.
1-3 Ionia Ave., Dept. 2216
Grand Rapids, Mich.

Gentlemen:—Send without any obligation, full and complete details of your Great Offer on Sparta "Hot Flash" Peanut Vending Machines.

Name.....

Address.....

Territory.....
(Mention approximate territory desired)

Please Mention Popular Mechanics

A MOTOR FOR YOUR BICYCLE

Attach powerful Belt Drive ROLLAWAY to your bicycle. **Forget pedals.** Ride in comfort. ROLLAWAY gives **positive, dependable power.** Light weight. Runs 100 to 150 miles on gallon gasoline. **Fits any bicycle.** Economical—costs **less than one-fifth cent per mile** to operate. Shipped complete. Anyone can attach in few minutes. Outfit includes motor, reinforced fork, wheel and guaranteed tire. Hundreds in use. A wonder for **economy and performance.** Price, F.O.B. factory $65.00. Write for circulars. Adds **joy, speed and comfort** to cycling.

Be Our Salesman!

Buy a demonstrator. Sell. Good commission paid. Write today for our proposition. Address

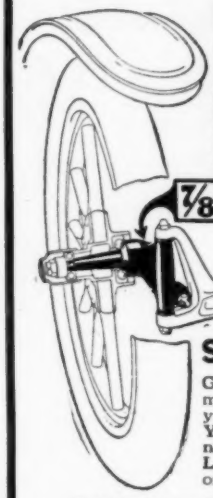
The Rollaway Motor Co.
621 Shepard Street
Toledo, Ohio

Rollaway
TRADE MARK

DISTRIBUTORS Wanted

Big Money For

FORD OWNERS



Steer your Ford with one hand at thirty miles an hour over rough roads. Shoot through sand, mud, gravel, in and out of ruts and over car tracks. Your front wheels CAN'T turn and ditch you. Your Ford will stick to the middle of the road like a Packard or a Cadillac if it is equipped with

7/8 INCH OFFSET *The* Wheel Trails

MOSPICO

SAFETY SPINDLES

Give another driver just five minutes behind your wheel after you put them on your car. You've made a sale. No talking necessary—they sell ***themselves.*** Liberal profit on every sale. All or part time.

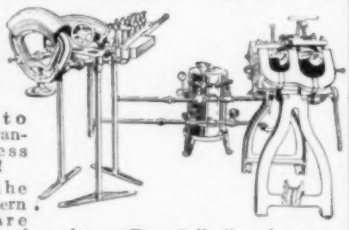
Get Exclusive Contract For Your County

Hundreds of Ford owners within a few miles of you. Most of them will buy after a five minute trial. Make big money wherever you drive your car with these and other fast selling accessories of our manufacture. WRITE US TODAY.

Motor Spindle Corp. 16 East Jefferson Avenue DETROIT, Mich.

Here's your chance to own a real TIRE REPAIR PLANT AT LOW COST

With prices on Western Adjustable and Non-Skid Molds now **reduced to a minimum**—with the mileage guarantee abolished by manufacturers and a contemplated increase in the price of tires—with us giving you complete instructions free either in one of our schools near you, or by our home study course—it's **your** opportunity to get in the vulcanizing business and **clean up!**



Prices of the Famous Western Equipment are now even lower than cheap "First Seller" equipment, for an outfit repairing all passenger tires, yet the same higher quality of material, workmanship and design, is maintained. They are the same adjustable molds—the same Non-Skid Retreaders with prices in reach of the man with more ambition than money.

Write us at once for particulars and tell us all about your own desires, ambition and conditions in first letter.

WESTERN RUBBER MOLD COMPANY
315-323 N. CRAWFORD AVE. CHICAGO

AUTO SUPPLIES WHOLESALE 3000 BARGAINS

SEND FOR THIS CATALOG — *it's* FREE!

Everything you need in Auto Supplies at Amazingly LOW PRICES.

NEMCO BARGAIN SUPPLY HOUSE
1017 Jackson Boulevard - Chicago, Ill.

GET A RAZO!

This unique Razor-blade pocket knife is the handiest, safest general utility knife. Uses an old Gillette blade. Artists, writers, draftsmen, tailors, dressmakers, office men, women, school children *all need RAZO.* Send 25c for yours today. Great money maker for agents.

RAZO NOVELTY CO.
23 E. Van Buren St. Chicago

Harley-Davidson

World's Champion Motorcycle

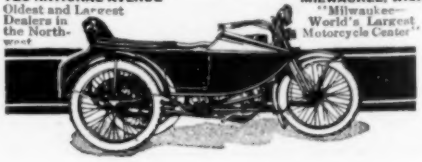
PRICES REDUCED ONE HALF
Rebuilt and Guaranteed

1915, three speed twin electric $125; 1916, $135; 1917, $150; 1918, $165; 1919, $180; 1920, $200. Shipped on approval. Catalog A free, describing Harley-Davidsons, Excelsiors, Indians, Smith Motors at $40 and upwards. Liberty Bonds taken at full face value. Letters of recommendation from hundreds of satisfied customers. Refs.: Banks and Harley-Davidson Motor Co. Rapid service on 1902 to 1922 Harley-Davidson parts. 100 page PARTS catalog B, 25 cents. Stamps or coin.

WISCONSIN CYCLE SALES COMPANY
726 NATIONAL AVENUE **MILWAUKEE, WIS.**

Oldest and Largest Dealers in the Northwest

"Milwaukee—World's Largest Motorcycle Center"



Every Good Musician Praises the KING

FOR more than a quarter century King Brass Instruments have been built to the specifications of world-famous musicians. Every King Instrument has the latest improvements — is built by an expert — and is thoroughly tested in our sound-laboratory before being shipped. That's why Every Good Musician Praises the King.

Perfect Instruments Easiest to Play

Whether you are just learning to play or are a finished musician you will find these wonderful King Saxaphones, Trombones, Trumpets, and Horns easier to play than any other make. The wonderful tone-quality of the King is admired by everyone.

It's easy to own a King Instrument. They are sent on trial, and sold on easy payments. By buying from the factory you save all the middleman's profits.

Get Price List of Used Instruments

We now have on hand a large stock of used instruments of other makes, rebuilt and refinished to look like new. They are sold for cash at very low prices. Ask for our list of used instruments, also for our catalog of new factory guaranteed Kings — Mailed no charge.

The H. N. White Company
5238 Superior Avenue :: Cleveland, Ohio

"KING" BAND INSTRUMENTS

Electric Motors *below* cost

Washing Machine Size Guaranteed to Satisfy

$10

Big manufacturer of electrical equipment canceled his order after we had them all made. Strictly high grade, entirely new motors. Chance of lifetime to get motor to run sewing, washing, ironing machine; compressor, bench lathe, drill press, etc. Write for circular.

REYNOLDS ELECTRIC CO.
2610 West Congress St., Chicago

Be A Floor Surfacing Contractor

New uncrowded field. Contractors prefer to sublet floor surfacing to American Universal Contractors. Machine does work of 6 men. Works quickly, easily. We set you up in business of your own, furnish office forms, advertising, etc.

Make $5,000 to $15,000 or More—Yearly

Prepare for big building boom. Make new floors perfect, old floors like new. Every floor a prospect. Big money in old floors. No town too small. Beginners often pay for machines first month with profit besides. Get full information.

THE AMERICAN FLOOR SURFACING MACHINE CO.
523 So. St. Clair St. Toledo, O., U. S. A

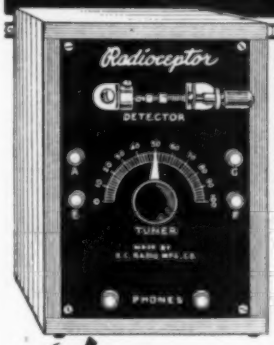
$104 PROFIT IN 3½ HOURS

G. A. Barton, Indiana, made that amount—making and selling **Candy Floss.** Others send in **amazing reports:** Small, Chicago, says-- **"Did $125** business on **Sunday."** Wendel, Kansas, writes, "Averaged **$128 a day** for **3 weeks."** Gardner reports, **"2,437 sacks** of candy sold from 11 a.m. to 10:15 p.m. **Big Money in Candy Floss!** Rees says: "Cleaned up **$225** in **4 nights** in **Greenville, Ohio."** **Candy Floss** is a delicious, novelty confection--fluffy, soft as cotton, white as snow, or any color or flavor. Can be made anywhere--in **store window,** in **parks,** on **street corners,** at **picnics, summer resorts, base ball games,** or wherever crowds gather. Machine easy to operate. Raw materials **plentiful** and **cheap.** Send name and address for free illustrated book of facts. Drop postal. Act now! Address

A. T. DIETZ
44 Sayso Bldg. Toledo, Ohio

FREE MY BOOK "CANDY SUCCESS"

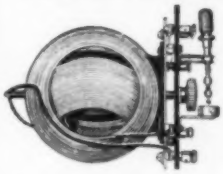
INTRODUCING—the Crystal Receiver



Order by Mail.
We Will Ship at Once!

If your dealer or jobber cannot supply you with a Crystal Receiver, write direct. List Price $18. Murdock or Frost head set $5.00. Antenna Completion Package, $5.00. Variometer, unmounted, $5.00. Send Post Office Money Order with your order.

A Radioceptor UNIT



In this—the first of Radioceptor Units—you find a receiver which combines improved electrical efficiency with beautiful mechanical appearance.

A very unusual and exclusive design of variometer forms the tuner--giving greater range of wave length than variometers heretofore designed. Only one adjustment. Continuously variable. No overlapping.

Details of finish include dark mahogany box, highly polished and engraved bakelite panels, buffed nickel parts.

The Crystal Receiver, altho complete in itself, combines with other Radioceptor Units to form a high grade long distance set.

KANSAS CITY RADIO MFG. CO.
605 Grand Avenue Kansas City, Mo.

Jobbers and Dealers—Notice!

Radioceptor Units are sold only through regular trade channels. Write today for our proposition. Stock Radioceptor Units NOW and "cash in" on the popular demand.

Recharge Your Battery at Home

Charges Both A and B Radio Batteries

Don't be without the use of your Radio Receiving Set while your battery is being charged. Get a Valley Charger and charge your battery right at home.

Attach the Charger to your home lamp socket—attach the clips to the battery terminals and you will get a quick, tapering charge which just exactly charges your battery, but cannot over charge or harm it in any way.

Will charge the A 6 volt battery at a 5 ampere rate, and the B 22½ volt battery at the required ½ ampere rate. 45 volt B batteries may be connected in parellel so that they can also be charged.

SATISFACTION GUARANTEED. If your local distributor cannot supply you, write direct to:

Valley Electric Company
Department C. St. Louis, Mo.

$18.00
F.O.B. St. Louis

2 RUGS $2.79

SEND NO MONEY

TAPESTRY RUGS

Excellent quality. Beautiful Persian Patterns. Attractive colors. Size 54in. x 27 in. Easy to clean—hard to wear out. $5 value. Just send name and address. Pay postman $2.79 and postage on delivery. Still bigger saving on five—$6.62 and a pair of 8-in. steel household shears FREE.

THE HOME BEAUTIFUL
Dept. 52, 12 W. 40TH ST., NEW YORK

5 Safety Keys $1.00

Only keys of their kind in existence—**open and test thousands of different locks.** Thousands of sets in use among locksmiths, realtors, policemen, detectives, firemen, mechanics, hardware men, travelers, hotel men, etc. Endorsed by all as an invaluable household necessity and convenience in emergencies. Tell you instantly if your locks are burglar proof. Novel chain FREE with keys. Send $1.00 today. We prepay postage.

MASTER KEY CO., 122 Manhattan Block Milwaukee, Wis.

CHINESE Good Luck Ring

This Mystic Chinese Symbol of Good Luck, Health, Happiness and Long Life has been looked upon with the deepest reverence by the Chinese for centuries. It is reputed by them to be almost uncanny in its power to bring Good Luck, Riches, Success in Love, Health and Happiness. Amazing stories of good fortune are told by its wearers.

Brings Fanny Brice "Ziegfield Follies" Star, $2,000.00 in 48 Hours

This famous stage beauty and popular idol says: "Forty-eight hours after I put on my Chinese Good Luck Ring, I received a check for $2000.00. It was an entirely unexpected present. I call it the best of luck." An actor who had been out of work over a year signed a contract three days after he put his ring on. A mechanic out of work for three months secured a job the next day. The fad of the hour in fashionable New York and Chicago society. Worn by rich and poor alike. Millions sold in the larger cities. Every man, woman and child should have one. Get your Chinese Good Luck Ring at once, or send one to some friend who has been unfortunate.

Send No Money

Don't send a penny. Just your name, address, state whether for lady or gentleman, boy or girl, and give ring size. We will send you a solid Sterling Silver Chinese Good Luck Ring at once by prepaid parcel post. When you receive the ring send us $1.50 plus a few pennies postage charge. Then wear the ring for ten days and if it does not bring you the best of luck or you are in any way dissatisfied, return the ring to us at end of 5 days and your $1.50 will be promptly refunded.

CHING LING FOO
Room 1057, 538 So. Clark St.
CHICAGO, ILLINOIS

The Best Shave you ever had

Genuine Bancroft Hollow-ground Razor—with the Everlasting Edge. Direct from manufacturer. Shaves clean. No pulling, scraping or smarting. Makes your face feel fine.

FREE TRIAL

Send No Money. Rush name and Address. Pay postman $1.75 on arrival. Use razor 10 days. If not satisfactory, money will be returned.

FREE: $1 HORSE HIDE STROP

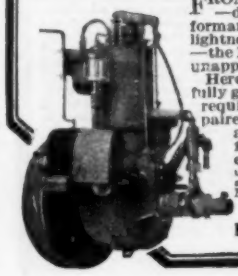
For 30 days only we will give a genuine horse-hide double leather strop **Free** with each razor.

A $4 outfit for $1.75 Order at once while they last.

BANCROFT RAZOR CORP.
151-A West 19th St. New York

Michigan Marine Motor $115

Repairs at any Ford Garage



FROM every standpoint—dependability, performance, quick starting, fuel economy, lightness, compactness, and low price—the Michigan Marine Motor stands unapproached.

Here is a 4-hp., 4 cycle, 125-lb motor, fully guaranteed for one year. It rarely requires adjustment and may be repaired at any Ford garage. Admirably adapted for tenders, launches, fishing boats, and other craft requiring a full-powered motor of unfailing reliability. With Bosch Magneto and impulse coupling, $20 ex.ra. Built by Michigan Marine Motor Company.

Special Dealer Opportunity

BELLE ISLE BOAT & ENGINE CO.
Dept. L, Detroit, Michigan

Make This Test Yourself

Pick up a pair of Neverslip Pliers—moisten a piece of paper between your lips and fit it between the cutting blades. Then grip your hands. Clip! The paper is cut clean as a whistle.

And you can bet your bottom dollar that a plier that stands the paper test will cut anything from a ten penny nail to the softest wire.

Neverslip Pliers cut clean because their cutting edges are made from high carbon crucible steel. But should the blades becomes accidentally damaged, they may be quickly and easily replaced—for they are renewable and the plier itself will last forever.

That's why Neverslips are guaranteed to outcut and outlast any plier made.

Most hardware dealers sell them.

Write for Leaflet

THE NEVERSLIP WORKS
NEW BRUNSWICK NEW JERSEY

NEVERSLIP
side cutting pliers

Neverslip Pliers are furnished in 6—7 and 8 inch sizes.

Huh! Give up?
You fellows can't shoot against me'n *Little Scout*

Ho! Looky there—tore another hole in it. Just 'cause you fellows're bigger'n me don't mean nothin'. Shootin' don't take size.

Aw, don't get sore. You-all could punch holes in the old can, too, if you had one o' those Stevens *Little Scouts*. Come on an' try it once.

Golly, boy! Watch 'at tin can jump. Didn't I tell you? Aint 'at *Little Scout* a bear?

Take a squint through the barrel

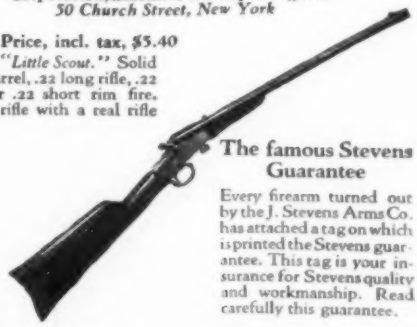
Pretty, pretty smooth, eh? You betcha! And you can just store this in the old bean: When a Stevens barrel is rifled, with each motion the cutter removes only the ***30th part of a thousandth of an inch.*** Just jot that down.

I've heard fellows say, "Gee, I'd like to have a rifle, but it costs too much."

Stevens puts a crimp in that bunk. Look at the Stevens prices. That's your answer. Shoot us in a postcard. Simply say, *"Send me catalog."*

J. STEVENS ARMS COMPANY
Department J259, Chicopee Falls, Mass.
Owned and operated by the Savage Arms Corporation, Executive and Export Offices: 50 Church Street, New York

Retail Price, incl. tax, $5.40
Stevens "Little Scout." Solid steel barrel, .22 long rifle, .22 long or .22 short rim fire. A real rifle with a real rifle barrel.



The famous Stevens Guarantee

Every firearm turned out by the J. Stevens Arms Co. has attached a tag on which is printed the Stevens guarantee. This tag is your insurance for Stevens quality and workmanship. Read carefully this guarantee.

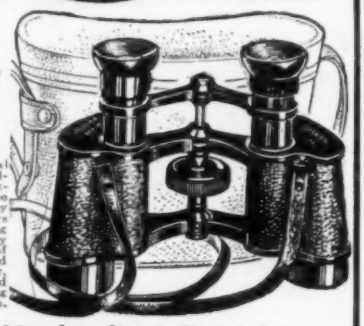
Stevens

Please Mention Popular Mechanics

Genuine BUSCH Jagdglas $16.25

A five power, extremely serviceable, handsome and well made field glass made by Busch (Germany), needs no introduction, as they are known the world over. These famous glasses up to a short time ago were unobtainable at any price. They are unusually light and compact, made of solid brass, covered with genuine morocco leather and trimmed with hard rubber. Solid leather carrying case and straps.
No. 2509 for $16.25.

Lomora Prisma Binocular $25.00



Equipped with central and individual focal adjustment, lenses extremely sensitive; can be instantly adjusted to any eye. These binoculars have an unusually long range (8x24mm). They are handsomely made of solid brass, covered with morocco leather, with shoulder strap and solid leather carrying case and straps. No. 2609 for $25.00.

All Our Merchandise is Brand New

Order one of these specials now. Supply Limited. Mail Orders promptly filled (Charges Prepaid) when accompanied by Money Order or Bank Draft, or if you prefer

SEND NO MONEY

Pay Postman on arrival, our price plus postage. Examine merchandise carefully and if not as represented just return same and get your MONEY BACK without any red tape whatsoever. Bank reference.

Illustrated Catalog No. 9 on Request

EDWARDS IMPORT TRADING CORP.
258 Broadway, Dept. 9, New York City

NERCO
(Unitone)
Head Phones

A 2200 OHM Head Set for $8.00

IMMEDIATE DELIVERIES ASSURED

The **Nerco** "Unitone" Head Phones are designed to give equal tone reproduction through both phones and to receive sounds sharply and clearly. They are correctly and scientifically built for receiving broadcast programs.

Nerco "Unitone" Head Phones have numerous mechanical features:

They are light, stable and have non-rusting diaphragms. They contain guaranteed tungsten magnets.

IMMEDIATE DELIVERY ASSURED

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THE BOOK YOU HAVE BEEN WAITING FOR

Gilbert Radio Telephone and Broadcasting - 35c postpaid

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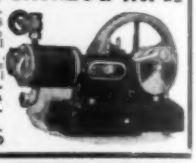
New goods, new prices, small boilers, engines, steam and gasoline, 1-8 H. P. up, pumps, castings, blue prints, gears, pulleys, electrical goods, model makers' supplies, materials, 3-4 H. P. Marine engine, 2 1-2 inch ga. model locomotive, etc. **Catalog postpaid 20 cents stamps (2 dimes preferred). Refunded first order.**



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AGENTS WANTED QUICK PROFITS! PERMANENT BUSINESS!

Monstrous proposition offered to agents to handle our Sanitary Aluminum Soap Dispenser. At the same time create a substantial and permanent income. We manufacture a milk powdered soap, highly scented for the machines, costing agents 15c per pound and selling for 50c. Agents establish themselves in permanent business by selling the machines to hotels, office buildings, private homes, and physicians.

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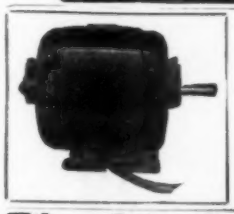

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Motors guaranteed 1 year.

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25c **Every Boy Wants a Pop Gun.** A Big, Strong, Rust-proof Automatic Break Gun. Nothing like it on the market. Wonderful value, price 25c. If your dealer can't supply you send 10c extra for postage.

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The natural wear of the stem ends of the intake and exhaust valves, cam shaft, cam bearings and tappet ends of your Ford engine results in improper timing of the valves, which causes **strangling of the motor.** New valves of the ordinary type will not help this condition to any appreciable extent. There is only one real remedy—

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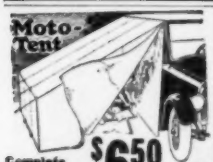

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Every Day Travel for Less than a Penny a Mile

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can be made out of your Sedan or Touring Car. Folds into very small package. Will last for years. Save hotel bills. Live out doors for better health and a good time. $14.50. Send no money. Pay your postman.

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$3.00 Always Accurate — **Carter Oil Gauge** for Fords and Chevrolet (490 and F.A.). Attaches to Instrument board. Connecting tube runs to elbow which screws to lower pt cock. No moving parts. Can't get out of order. **Satisfaction guaranteed** or money refunded. **Carter Motor Accessories, Inc.,** 390 Pearl St., Buffalo, N. Y.

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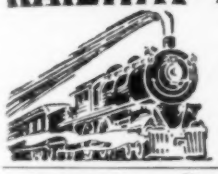

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With Every Modern Writing Convenience

Write Today for Illustrated Circular Explaining Try-Before-You-Buy Plan

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A jointed figure of a skeleton 14 in. in height, will dance to music and perform various gyrations and movements while the operator may be some distance from it. **10c pd.**

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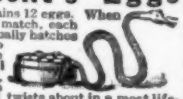
Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which curls and twists about in a most lifelike manner. **Price per box, 10c ppd.**



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Quaint and Novel Design

A VERY striking and uncommon ring. Silver finish, skull and crossbone design, with two brilliant, flashing gems sparkling out of the eyes. Said by many to bring Good Luck to the wearer, hence its name, **Good Luck Ring.** Very unique ring that you will take a pride in wearing **ONLY 25 CENTS.**

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Oil! It's the life blood of your motor. And yet it's usually the most neglected factor. Scored cylinders, ruined bearings, broken piston rings and connecting rods—that's the penalty of **dry driving.** Don't **guess** you have enough oil in your crank case. Know for a certainty. Play safe. **Oil is cheaper than repairs.**

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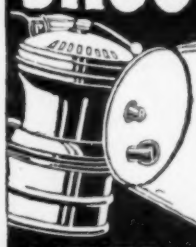
Absolute Protection **$3.00**

RAJO OIL GAUGE FOR FORDS

SHOOTS 300 FEET TURNS NIGHT INTO DAY $1.25



The **AUTO-LITE** is a patented lamp that throws a powerful brilliant light 300 feet. No smoke. No grease. No sparks. Light without matches. Not affected by wind or rain. All you need is carbide and water. Safe, sure and simple to operate.

FOR Camping, Hunting, Fishing, Boating, Hiking, Auto Tourists, Trouble Shooting, Boy Scouts, Night Emergencies

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ORDER ONE TODAY

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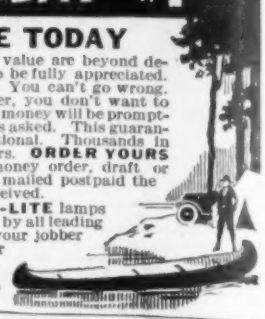

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At Small Cost

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Change your coal or wood stove into a gas stove in 3 minutes. A Child can do it. Burn kerosene Vapor Gas—hotter than coal or wood and costs less. Safe and simple.

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Just turn a valve and get even heat instantly. No ashes, no dirt, no smoke, no wood to chop or carry. No fires to build and feed. No fuel wasted. Cooks and bakes better. No damage to stoves. Makes its own gas from common coal oil, cheapest, cleanest fuel. Guaranteed five years. Money back if not satisfied after 30 days trial.

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This big, valuable book sent without obligating you in any way. Learn how to treat yourself for ailments caused by disordered nerves, impoverished blood or poor circulation. Build up cells and tissues to healthy activity, banish aches and pains and eradicate poisons.

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A Simple Practical Dependable Extinguisher for only **$5**

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MILLIONS OF PEOPLE want a handy, reliable fire extinguisher but they've held off paying $15 or $20. The **FUGO AUTOMATIC**—just patented—costs only $5 and is just as efficient, just as dependable as the highest priced. Everyone can afford one—agents take orders on every call. Nothing like it at the price—**a 5 minute demonstration sells it**—no talking—no arguments. An inexperienced agent can take 4 orders a day—others book 10 orders—easily. No competition—the field is unlimited. Customers so pleased they tell others—sales multiply fast.

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Get Our Plan—TODAY
You don't hear of an invention like this every day—don't delay. Trained agents will jump at this opportunity. **Write now for full particulars** showing big possibilities for YOU. Sample Fugo Automatic FREE.

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Popcorn and Peanut Machine

Pops, advertises and sells popcorn. Also sells toasted and salted peanuts. You make 60c to 70c profit from each $1 in sales. Three to four times greater percent of profit than cigar counter or soda fountain. Capacity $1 to $9 an hour—$6 to $54 in 10-hour day. Wonderful success—turns waste floor space into cash for you.

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IT explains how the Butter-Kist machine stops people: coaxing fragrance makes them buy; toasty flavor brings trade for blocks; stimulates other sales; pays like a little gold mine. It gives new low prices, easy terms, and letters from Butter-Kist owners. Mail coupon now!

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Name .....

Business ..... How long in business .....

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Have you copy of our book, "America's New Industry"? .....

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62

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Every receiving outfit uses storage battery. Over **six hundred thousand in use today.** Increasing at rate of **hundred thousand monthly.** All must be recharged often. Repairs will be amazing. This field alone offers tremendous opportunities

EVERY AUTO MUST HAVE BATTERY

Almost **ten million** cars swarming country. All—even Fords—have batteries. Car owners seeking money-saving bargains. You can quickly learn to build **guaranteed** batteries. Can knock competition sky high and still make big money. This is your chance. Opportunity has knocked. Throw open the door. Drop everything and get busy. Nothing to stop you.

LITTLE MONEY STARTS YOU

We furnish everything needed. Fit you out complete with boxes, plates, terminals, tools, distillers, materials, supplies and directions. Our instruction course plain and simple. You can learn almost over night. No business on earth offers greater chances for success. No business on earth can be started with so little money. Don't wait a minute. Get in on ground floor. It's the coming industry. Demand for storage batteries never better. Market increasing by leaps and bounds.

WRITE QUICK FOR DETAILS

It's a proposition you can handle. Nothing hard about it. Pleasant, fascinating work. We help you to the limit. We have been in business over twelve years. Have put thousands of men into business. We'll do the same for you. Write or wire today.

Haywood Hypower Battery Co.
1363 CAPITOL AVE. INDIANAPOLIS, IND.

Baby Grand Lathes

Not a Toy---Just Like a Big One

For either metal or wood working—ideal for auto and electric repair shops, pattern and model shops. Because of their simplicity and compactness, we are able to build into each Baby Grand Lathe the same Quality that characterizes the finer types of big lathes—and at a price within the reach of everyone, everywhere.

Put One on Your Bench at Home

Baby Grand Lathes develop talents, make more producers and provide a means of carrying out your ideas right in your home. Do your own work on either metal or wood. WONDERFUL FOR THE BOY.
They are light, compact and simple to operate, but at the same time so sturdy that the highest quality of work is produced. Manual Training teachers endorse the Baby Grand. It is a wonderful help to the student at home. The lowest priced GOOD LATHE ever produced.

Write for Prices and Details

6 In. Swing
12 In. Between Centers
20 In. Bed

THE WATSON MFG. CO.
26 Post St., Toledo, Ohio

AGENTS Wanted for open territory; Exclusive agency. Highest quality of Approved Lightning Rod. More than 1,000,000 buildings now protected. Fire Insurance Cost give reductions in rates.

Your Chance to MAKE a real Success

Sell a necessary protective device for every exposed farm structure. Most profitable and easiest to sell. We help you to sell. Goods are perpetually guaranteed. "KRETZER" Brand Rods are well worth the **MONEY**

Write today—before territory is gone and ask for our Booklet "Lightning and Lightning Rods."

ST. LOUIS LIGHTNING ROD CO.
2140 DeKalb St. St. Louis, Mo.

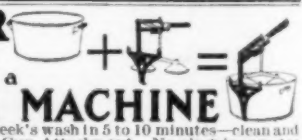
CRYSTAL RADIO SET, $4.75

Complete in Cabinet as shown.

Head Telephone and Antenna, $5.00 extra. Satisfaction guaranteed or Money Refunded.

CORONA RADIO CORPORATION
265 Canal Street, New York

MAKE YOUR wife's or mother's wash tub into a WASHING MACHINE



It's child's play to do your week's wash in 5 to 10 minutes—clean and without wear, with the Vac Cup Attachment. No electric or water power necessary. Vacuum and suction principle—formerly the Dodge and Zuill Syracuse "Easy." Sent on 30 days' free trial. Easy monthly payments if desired. Send postal card for how to save work.

BURLINGAME MFG. CO. 622 Sunset Ave., Syracuse, N. Y.

Light Fibre Legs and Arms

636 Dean Bldg.
RAY TRAUTMAN Minneapolis, Minn.

100 SHOTS FOR 1¢

NEW PATENT 500 SHOT revolver shoots 7 shots in 3 seconds just pull the trigger. Will shoot 500 times with one loading. Reloads automatically after each shot. Ammunition costs only **5c for a package of 500 shots.** Regular pocket model genuine gun metal finish comes loaded ready for 500 shots. Each shot **absolutely harmless.** Sent postpaid to any address for **only 77c** or 2 for $1.50, stamps not accepted. Order direct from this ad. **Shipment guaranteed in 24 hours.**

THE IRVING A CO., 1636 So. Lawndale Ave., Chicago, Ill.

CROSLEY Radio Apparatus

is low in price because it is simple in construction

Crosley Radio goods are quality goods. Quantity production is responsible for the reasonable prices of Crosley Radio parts.

CROSLEY
Harko Senior Receiver
Pictured Below

This highly efficient tuner and detector will of itself without amplifier bring in from hundreds of miles, concerts loud and clear with head phones alone. The hook-up is Crosley non-regenerative, efficient, yet simple. Do not mistake the low price as an indication of its quality. Detroit, Pittsburgh, Chicago, Newark, etc., are heard regularly in Cincinati. Pittsburgh is heard constantly in Minnesota and Denver hears Schenectady nightly on this receiver without amplifier. Well built, finely finished in mahogany color.

$20

$20 is the price without batteries, head phones or tubes.

1
Crosley Rheostat for vacuum and filament control. Thoroughly efficient. Price 60c.

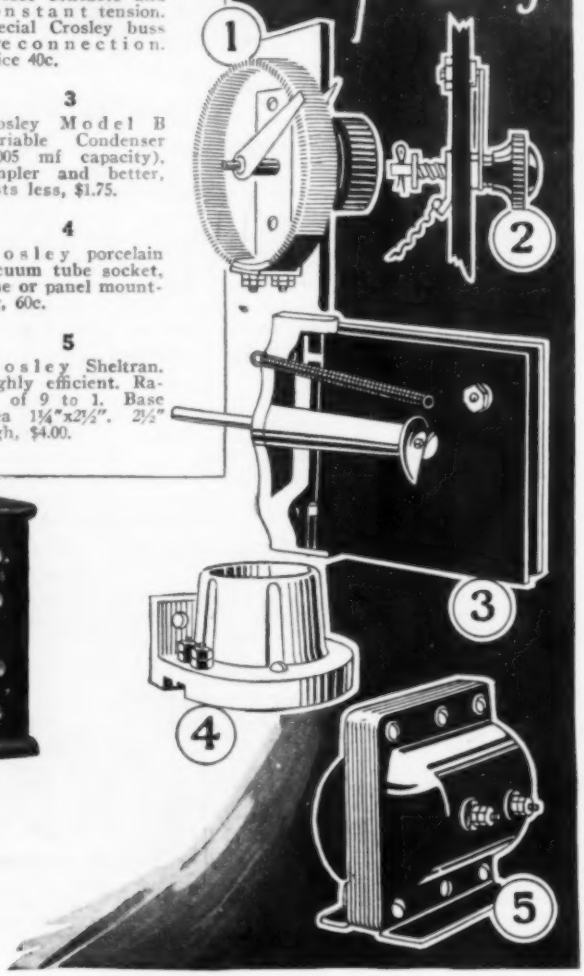
2
Crosley Tap Switches, perfect contacts and constant tension. Special Crosley buss wire connection. Price 40c.

3
Crosley Model B Variable Condenser (.0005 mf capacity). Simpler and better, costs less, $1.75.

4
Crosley porcelain vacuum tube socket, base or panel mounting, 60c.

5
Crosley Sheltran. Highly efficient. Ratio of 9 to 1. Base area 1¼"x2½". 2½" high, $4.00.

Crosley Parts
better - cost less - write for catalog



If your dealer cannot supply you, write for our complete Radio Apparatus and Radio Parts Catalog and send us his name.

THE CROSLEY MFG. CO.
Department PM522
CINCINNATI OHIO

Ernest Pechin
Cornet Soloist

Mathew Amaturo
Saxophone Soloist

John Dolan
Cornet Soloist

Simone Mantia
Euphonium Soloist

Eugene LaBarre
Cornet Soloist

CONN RADIO CONCERTS

Brass Choir
San Francisco Symphony
Orchestra

Pictured here are some of the artists appearing in Conn Radio Concerts. Above—Frank Westphal's Rainbow Garden Orchestra, Chicago.

THIRD OF NATIONAL SERIES—*Friday Evening, May 19*

CONN radio concerts have taken the nation by storm! Our programs of March 17 and April 14 by America's leading dance orchestras and nationally famed soloists have occasioned universal admiration for Conn enterprise.

Isham Jones, Joseph Smith, Frank Westphal, Hal Nichols, D. C. Rosebrook and their orchestras have already played; Benne Henton, Charles Randall, John Leick, Mable Keith Leick and Fred Tait have given solos. More of their calibre are to appear.

Travelers on shipboard 1500 miles from the Atlantic and Pacific coasts, people in Northern Canada and in Central America will enjoy the same music which will be heard throughout the United States May 19.

Think of it—Conn Ltd. is entertaining people by wireless a quarter of the way around the globe

May 19 programs will be broadcasted from:

New York, Station WJZ;
San Francisco, Station KDN;
Detroit, Station WWJ;
Chicago, Station KYW;
Pittsburgh, Station KDKA;
New Orleans, Station WAAB;
Denver, Station ZAF;
Kansas City, Sweeney Station
Seattle, Wash., Station KGB

Conn dealers are entertaining at radiophone concerts. Watch for local announcements.

Write to Conn Ltd. now for new saxophone book; FREE. Tells why the Conn is the world's finest, choice of the famous artists on the radio programs.

631 Conn Building C. G. CONN, LTD. Elkhart, Indiana

Agencies in All Large Cities

Conn New York Co., 233-5-7 W. 47th St.
Conn Detroit Co., 243 E. Grand River Ave.
Conn New Orleans Co., 317 Baronne St.
Conn Chicago Co., 62 E. Van Buren St.
Conn Seattle Co., 1609 Third Ave.
Conn Portland Co., 127 Tenth St. (Oregon)
Conn Cleveland Co., 1220 Huron Road
Conn Atlanta Co., Auburn and Ivy Sts.

CONN

WORLD'S LARGEST MANUFACTURERS OF HIGH GRADE BAND AND ORCHESTRA INSTRUMENTS

$215.00 In One Day

A Whirlwind Summer Seller Agents Are Making Fortunes!

F. W. BENTLEY
of Philadelphia, says:
"Ye Gods—some seller. I made $215.00 today."

J. Carnegey of S. D., says:
"Am making $1000 a month. I have made big money before, but did not expect so much. Your Burner is just the thing."

NO wonder this amazing new invention is making fortunes for agents. Everywhere, this new device is doing away with the muss, dirt and drudgery of coal and wood fires—saving housewives from roasting kitchens in Summer. It turns any coal range into a gas stove—in just one minute. Then simply turning a valve instantly gives just as much or as little heat as is needed—only when it is needed. That's why the Oliver Improved Oil-Gas Burner is making fortunes for agents. You don't need experience to get your share. The device sells itself upon sight. Send the coupon today for full particulars.

Turn Fire on and off with a valve

New Invention Ends This Drudgery-Sells Like Wildfire

SUPPOSE you were a housewife who had to sweat and fume and fuss over a hot mussy coal and wood stove in a roasting kitchen in July. You'd ***jump*** at the chance to buy a device that turned coal and wood stoves into gas ranges and gave you a cool kitchen all Summer—gave as much heat as you needed in the Winter—and banished forever the drudgery of building fires and emptying ashes.

That's why housewives all over the country are clamoring for this amazing new invention. That's why salesmen are cleaning up on the Oliver Oil-Gas Burner.

It isn't hard to sell a thing that everybody wants. And the Oliver makes an instant hit with everyone because just by the turn of a valve—like a gas stove—it gives instant heat only when it is wanted.

Another thing: The Oliver burns 95% air and 5% oil, the cheapest fuel there is. It is not a mere kerosene wick burner. A new invention turns the oil and air into gas It is the gas that burns. Now you know why W. H. Drew of Michigan made $85.00 in one day; why L. Zucher of Ohio made $21.50 in 3 hours; why R. Burger of Ontario in one week earned $258.50; why A. M. Russell of Connecticut has averaged $660.00 for the last 6 months; why one order sent by P. M. Ford of Iowa gave him a profit of $646.25.

Quick Sales--Big Profits

These men know a good thing when they see it and they know that an invention that makes effective use of the cheapest fuel and at the same time frees women from the drudgery of wood and coal fires, sweltering Summer kitchens, and the dirt of ashes is the thing they want to tie up to.

No Experience Needed to Make Big Money

You do not need to be a high-powered salesman. The Oliver's amazing features sell it for you. Every agent we appoint makes big money. You, too, can use this secret of making big money easily. We have a number of definite territories which we are ready to dispose of to those who act quickly.

COUPON BRINGS FULL OFFER

Mail this coupon now for our offer. We are not making any extravagant claims about this. We don't have to. We want to give you the facts. Writing will not obligate you in any way. But by acting quickly you will receive our offer in time to get an exclusive territory franchise with private selling rights—if you want it.

But hurry. Send the coupon at once if you want to get in on this big-money, whirlwind Summer seller.

OLIVER OIL-GAS BURNER & MACHINE CO.
2014-R Pine St. St. Louis, Mo.

Oliver Oil-Gas Burner & Machine Co.
2014-R Pine St., St. Louis, Mo.

Please send me full facts about how I can make big money representing you in my territory. Also your plan if I wish to make big money in my spare time.

Name .....

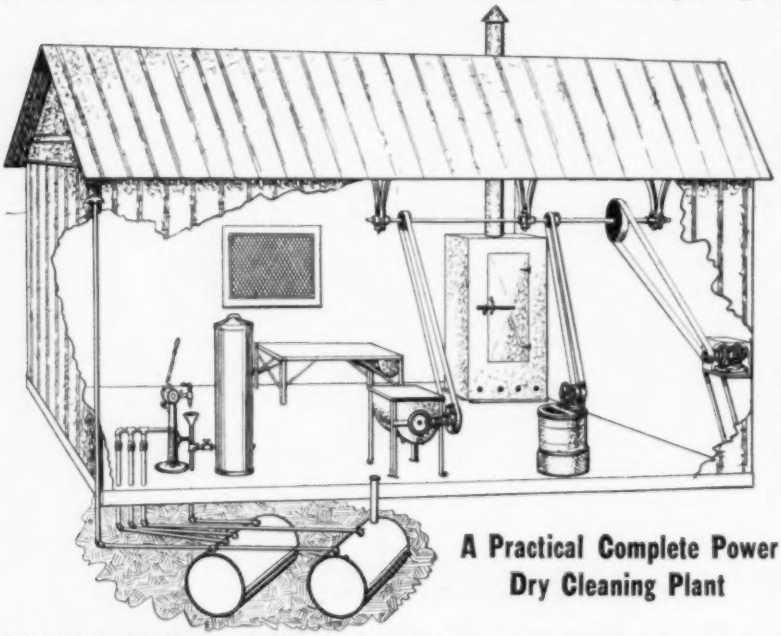
Address .....

Establish a Profitable Business of Your Own

With a small investment you can install our Complete Dry Cleaning Plant which will not only yield you good returns, but will grow into a large establishment. There is a growing and profitable field for anyone in the Dry Cleaning Business and we urge you to avail yourself of this unusual opportunity of installing our Complete Dry Cleaning Plant.

Order our Complete Dry Cleaning Plant at once, or, write us for full information. It is our earnest desire to assist and co-operate with you. Many men have made a success of this business who had absolutely no experience when they first started.

We furnish the inexperienced man with a guide to Dry Cleaning.

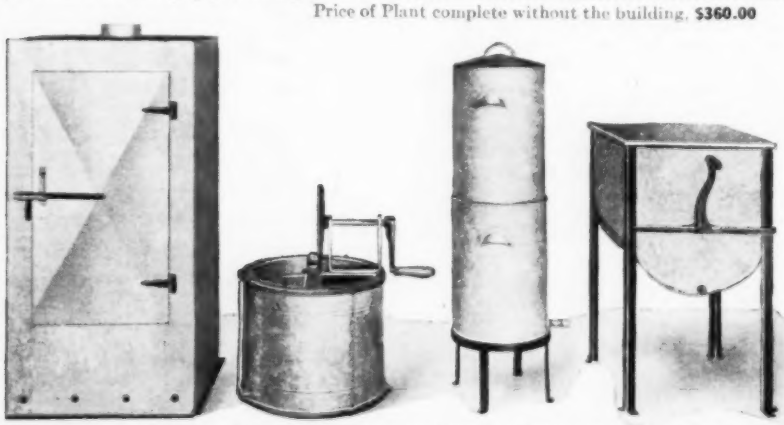


A Practical Complete Power Dry Cleaning Plant

Has an Earning Capacity of $480.00 per Week

One Portable, All-Metal Fire-Proof Building with two windows, one door and gas-tight motor box with outside door and ventilator, a ¾ H. P. Motor and Overhead Transmission, One Six-Suit capacity Dry Cleaner, One Six-Suit Capacity Extractor, One 50 Gallon Capacity Gasoline Filter, One Scrub Table, One Six-Suit Capacity Electric Dry Room, and Underground Gasoline Storage System. Price Complete, as per illustration, except pipes leading from tanks **$735.00**

Price of Plant complete without the building, **$360.00**



The Midget Complete Hand Plant

This is not a toy; it does the same high grade work as machines that cost more money and is designed to start you in the Dry Cleaning Business with the least outlay. This Plant consists of One Four-Suit Capacity Hand Dry Cleaner, One Four Suit Capacity Hand Extractor, One 25-gallon Capacity Gasoline Filter and One Four-Suit Capacity Electric Dry Room. Price Complete **$120.00**

TERMS—Send draft or Money Order for ⅓ the amount with your order. Balance payable upon delivery. Export orders must be accompanied by U. S. Exchange for the full amount. All machinery is shipped F.O.B. factory.

G. R. SCHMIDT WOOLEN COMPANY

The Most Complete Tailors' Supply House

Woolens, Tailors' Trimmings and Supplies, Cleaners' and Dyers' Supplies, Launderers' and Hatters' Supplies

900-902 Washington Avenue, St. Louis, Mo.

LEARN A TRADE

Young man—you want A BETTER JOB—more money—opportunity—success. If you are mechanically inclined write me today—don't bother about a letter—just a postcard will do—or clip and mail the coupon.

MAIL COUPON NOW

I Will Make You an Amazing Offer

If you are interested in mechanical work, if you are interested in automobiles and WILL WORK, this Million Dollar Trade School offers you an opportunity that may never come to you again. Will you PUT EIGHT WEEKS' TIME in this great trade school IF YOU ARE CONVINCED IT MEANS A REAL JOB AND A LIFETIME SUCCESS? Because of the demand for Sweeney trained men I am making now MY BIGGEST AND MOST SURPRISING OFFER—no matter where you live—no matter if you have had no previous experience—no matter how old you are. But I will make this offer ONLY to those who are sufficiently IN EARNEST and SUFFICIENTLY ENERGETIC to write me AT ONCE.

The Sweeney System

famous the world over, can be had only in the Sweeney School. Trains men to be mechanics by practical work. You learn by doing—no books—you do the actual work. The course takes only 8 weeks. No place in the world can you get so much real instruction—so much actual value, for so little money. Over 46,000 graduates. Write me today—don't put it off—I've got some information that will open your eyes—but you must take the first step—Write for my Big Free Book.

Pick the Job You Like

Chauffeurs	$90 to $150
Truck Driver	$125
Tire Vulcanizers	$100 to $200
Welders	$140 to $200
Battery Men	$150 to $200
Auto Mechanics	$6 to $10 a day
Auto Electrician	$225
Tractor Engineer	$10 a day
Garage Mgr.	$150 to $400
Demonstrator and Salesman	$150 to $500

Free Radio

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The Sweeney School is always the leader. That is why I am offering this great new development free.

Good Jobs for You

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EMORY J. SWEENEY
President
1024 Sweeney Bldg.
Kansas City, Mo.

Please send me free without any obligation on my part, your 72-page catalog and your Sweeney School News. Tell me of the opportunities in the Auto and Tractor Business.

Name.....

P. O..... State.....

LEARN A TRADE
Sweeney
SCHOOL OF AUTO-TRACTOR-AVIATION
1024 SWEENEY BLDG. KANSAS CITY, MO.

This Beautiful Book on Wood Finishing FREE

GIVES complete instructions for finishing all wood—hard or soft—old or new. Explains just what materials to use and how to apply them. Tells how inexpensive soft woods may be finished so they are as beautiful and artistic as hard wood. This book is the work of experts—illustrated in color. Includes color card—gives covering capacities, etc.

JOHNSON'S WOOD DYE

Use coupon below for a free copy of "*The Proper Treatment for Floors, Woodwork and Furniture.*" It is full of valuable ideas on Wood Finishing and Home Beautifying.

S. C. JOHNSON & SON, Dept. PA6, Racine, Wis.

Please send me, free and postpaid, your instruction Book on Wood Finishing and Home Beautifying.

NAME.....

ADDRESS.....

CITY & STATE.....

Dealer's Name.....

Johnson's Wood Dye is very easy to apply—dries in four hours and does not rub off or smudge. Penetrates deeply, bringing out the beauty of the grain. Made in fourteen popular shades, all of which can be easily lightened or darkened. Color card in book.

S. C. JOHNSON & SON
"The Wood Finishing Authorities"
Dept. PA 6 RACINE, WIS.
Canadian Factory—Brantford

LEARN A TRADE

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The Sweeney System

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Name.....

P. O..... State.....

Tire Agents Wanted

Start Money Rolling In by the Amazing Mellinger Plan

Earn and Bank Big Money without risking one cent. I will start you, as I have started so many others, in a business of your own. Begin all or part time. The Mellinger Plan is revolutionizing the tire business. A positive proven success. Different from anything you ever heard of. No previous experience needed. Tires shipped prepaid on approval. No risk. Save car owners money. Just what millions of tire buyers have been looking for. Piles up profits for Mellinger agents.

I Guarantee Your Profits **LET ME PROVE THAT YOU CAN EARN FROM $100.00 TO $400.00 A MONTH.** I don't ask you to risk one cent. Make your car an asset, not an expense. I don't care what you have been doing or whether you live in city or country. Storekeepers, garage men, clerks, farmers, young fellows discontented with mere jobs, all sorts of people got this Mellinger Plan and almost over night made a financial success that changed their whole lives. If you want to know the quickest way to make real money get my BIG FREE BOOK TODAY.

One Billion Dollars will be spent for tires in the next few months. You can dip your hands into this golden flood and take out all the money you need. Whether you want **CASH, CASH, CASH,** or simply want guaranteed mileage tires for yourself at **LOWER** prices, write today. Rubber, cotton, labor, chemicals have all gone down. Get the facts. Buy at wholesale prices. Get the discounts. See how the **MELLINGER PLAN** saves car owners big money. My new low prices amaze everybody. Get my inside figures. Better tires for less money makes business just roll in for Mellinger Agents. There's a BIG REASON WHY.

Guaranteed by Bond 10,000 Miles

Mellinger Hand-made, Oversize, Cords and Extra Ply Tires are the finest, most serviceable made. Super-vitalized rubber makes riding easy. New bead construction. My exclusive tread, protected by U. S. Patent No. 68612, gives 10% greater wearing surface. **Absolutely Guaranteed.** I specifically guarantee by legal bond, Mellinger Tires up to 10,000 miles. Ninety-eight leading Manufacturers say: "We do not guarantee mileage." **Mellinger guarantees mileage.**

MAIL COUPON TODAY FOR BIG *FREE* BOOK!

MADE $1436

Tweedie, of Maine, sells $1436.00 in few short weeks; A. M. Amigo, of Santurce, Porto Rico, sold $4024.00 in seven months; Keighley, of Idaho, says: "I have sold $900.00 worth of tires since I took the agency and all have given good satisfaction"; Hincheliff, Pittstown, Pa., sold $1,500.00 the first month; A. Franklin, Pennsylvania, sells $600.00 a month.

FREE

This picture shows the **MASTER SALESMAN.** I send this sample Kit absolutely Free. Literally makes them buy. A substantially bound portfolio containing good size samples of fabric, cord, rubber, cross sections cut from tires and pure gum tubes. In 5 Minutes you can demonstrate tire secrets that the average dealer knows nothing about. This Kit was developed by a Mellinger Agent who sells over $50,000 worth of tires annually. He says: "It's like taking a prospect thru the Factory. The Kit sells the prospect and I take the order." You have everything you need to start right in taking orders. This Star Salesman's Kit is very expensive, but I will gladly send it to you Free if you are in dead earnest.

If You Own a Car! **WRITE ME QUICK.** Don't buy anyone's tires until you see these amazing values—see these tires on your own car. THINK OF IT. Oversize Cord Tires for less than fabrics used to cost. If there is no authorized Mellinger Agent in your locality, I will want one owner to show and recommend Mellinger Tires. I will ship this magnificent Cord Tire prepaid. For a little of your time and enthusiasm, I will make you a surprising offer that will give you a set of tires FREE. Be the first from your locality to get my Confidential offer. Mail the coupon, today—right now; tear it off now. It's your big opportunity. Get this free book that has proven the golden key to thousands. **DON'T MISS IT.**

Mr. B. L. Mellinger, Pres.
Mellinger Tire & Rubber Co.,
1045 Oak St., Kansas City, Mo.

Without obligation, send me details of the Mellinger Plan, Free Book and Wholesale Prices and how, without investing money, I can become your authorized agent.

Name.....

Address.....

B. L. Mellinger, *President*

MELLINGER TIRE & RUBBER CO.
1045 OAK STREET **KANSAS CITY, MO.**

References: Any Bank or Trust Co., or Any Publication

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